SD451.5
A23C6

TIMBER MANAGEMENT PLAN

FLAGSTAFF WORKING CIRCLE
(INCLUDES FLAGSTAFF FEDERAL SUSTAINED YIELD UNIT)

COCONINO NATIONAL FOREST
REGION 3

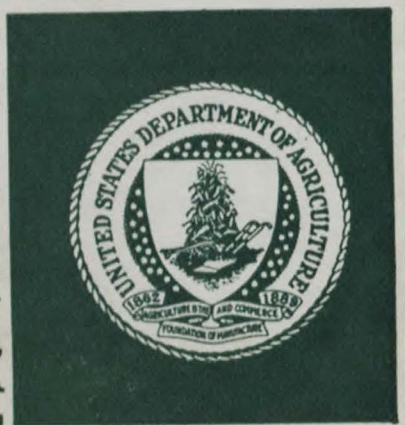
SIXTH REVISION
JULY 1, 1963 THROUGH JUNE 30, 1972

U. S. FOREST SERVICE

AD-83 Bookplate
(1-63)

NATIONAL

AGRICULTURAL



LIBRARY

LIBRARY COPY
ROCKY MT. FOREST & RANGE
EXPERIMENT STATION

2410
Plans - Coconino

TIMBER MANAGEMENT PLAN

FLAGSTAFF WORKING CIRCLE
(INCLUDES FLAGSTAFF FEDERAL SUSTAINED YIELD UNIT)

COCONINO NATIONAL FOREST
REGION 3

SIXTH REVISION
JULY 1, 1963 THROUGH JUNE 30, 1972

APPROVED: February 4, 1965

LIBRARY COPY
ROCKY MT. FOREST & RANGE
EXPERIMENT STATION

SD431.5
A23C6

SIXTH REVISION

TIMBER MANAGEMENT PLAN

FLAGSTAFF WORKING CIRCLE

(INCLUDES FLAGSTAFF FEDERAL SUSTAINED YIELD UNIT)

COCONINO NATIONAL FOREST

REGION 3

1963

Prepared By:

/s/ James W. Thorne

/s/ N. E. Johnson — December 3, 1964

Approved By:

/s/ R. M. Housley — December 3, 1964
Forest Supervisor

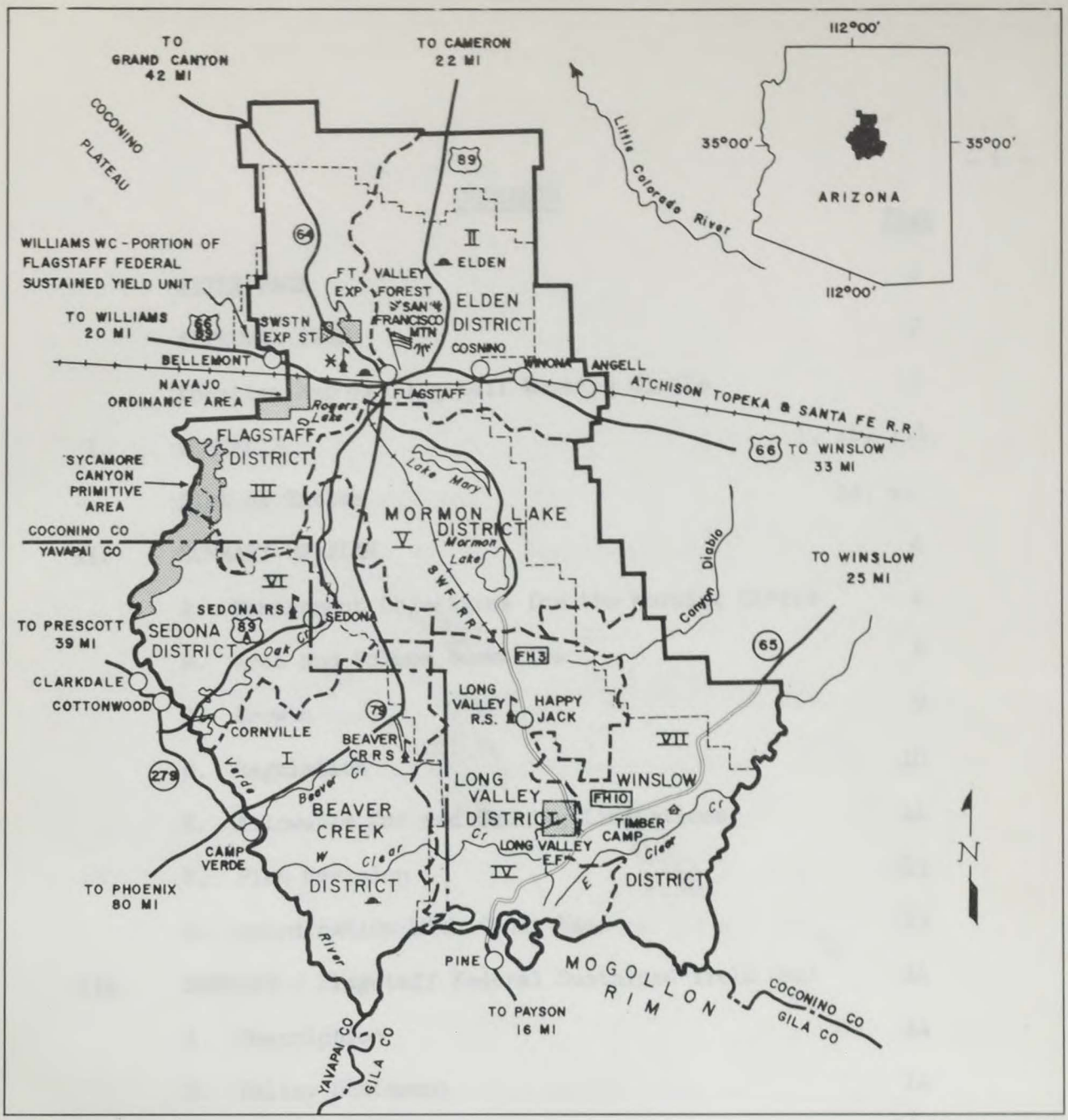
/s/ Fred H. Kennedy — December 12, 1964
Regional Forester

/s/ A. W. Greeley — February 4, 1965
Acting Chief

BP
DJM

Reviewed By:

Divisions	Forest		Regional Office	
	Initials	Date	Initials	Date
Timber Management	N.J.	12/2/64	MCG RWP JWT	12/7/64
Engineering	R	12/2/64	RJN DFR	12/4/64
Multiple Use	JHP	12/2/64	LGW	12/4/64



R.H. Cravens July, 1962

LOCATION MAP

FLAGSTAFF WORKING CIRCLE

COCONINO NATIONAL FOREST

R-3

Scale: 1 0 2 4 6 8 10 Miles

- Forest boundary
- Ranger district boundary (coincides with block boundary)
- County line
- Boundary of Flagstaff Sustained Yield Area
- Supervisors headquarters
- Working Circle boundary coincides with forest boundary
- Ranger station
- * Ranger district headquarters at Flagstaff for Elden, Mormon Lake and Flagstaff.

- 89 — Federal
- 79 — State
- 4157 — Forest
- Railroad
- Mfg facilities
- Timber Camp

I. CONTENTS

		Page
	TITLE PAGE	1
	APPROVAL PAGE	2
	Location Map of Flagstaff Working Circle	3
I.	CONTENTS	i, ii, iii,
	List of Tables	iv, v.
II.	SUMMARY OF PLAN	4
	A. Management Objectives for the Working Circle	4
	B. Area and Volume Summaries	6
	C. Growth	9
	D. Regulation	10
	E. Allowable Cut and Cutting Limitations	11
	F. Plan Revision	13
	G. Coordination With Other Uses	13
IIa.	SUMMARY - Flagstaff Federal Sustained Yield Unit	14
	A. Description	14
	B. Policy Statement	14
	C. Designated Operators	15
	D. Carry-over	19
III.	INTRODUCTION	20
	A. The Coconino National Forest	20
	B. The Flagstaff Working Circle	21
	C. The Federal Sustained Yield Unit	22
	D. Stand Characteristics	23
	E. Past Accomplishments	25

CONTENTS (continued)

		Page
IV.	PROBLEMS	27
	A. Watersheds	27
	B. Mining	27
	C. Grazing	27
V.	MANAGEMENT PRESCRIPTION	28
	A. Silvicultural Systems, Rotations, and Cutting Methods	28
	B. Special Treatments	31
	C. Noncommercial Thinning, Release Cutting, and Precommercial Clearing	33
	D. Commercial Thinning and Pulpwood Cutting	34
	E. Cutting of Other Products	34
ACTION PLAN		35-49
	Review and Revision Control Schedule	35
VI.	MANAGEMENT CONTROLS	36
	A. Inventory	36
	B. Compartment Examination and Multiple use Prescriptions	37
	C. Regeneration Controls	37
	D. Calculation of Planned Cut	39
	E. Marking Rules	40
	F. Records	40
	G. Cutting Budget	41

CONTENTS (continued)

		Page
VII.	TIMBER DISPOSAL POLICY	43
	A. Sales and Point of Manufacture	43
	B. Utilization	43
	C. Logging Methods	43
	D. Small Products	43
VIII.	FOREST DEVELOPMENT	44
	A. Transportation	44
	B. Reforestation	45
	C. Timber Stand Improvement	45
	D. Fire Control	46
	E. Rodent Control	47
	F. Animal Control	48
	G. Slash Treatment	48
	H. Acquisition Needs	48
IX.	INSECT AND DISEASE CONTROL	50
	A. General Conditions	50
	B. Special Problems	50
	C. Handling Abnormal Conditions	50
X.	APPENDIX , Index	51-52

LIST OF TABLES

Table	Title	Page
1	Ownership Status	6
2	County Summaries	6
3	Commercial Forest Land	7
4	Other Forest Lands	7
5	Forest Lands by Forest Type	8
6	Aspen Volumes	8
7	Periodic Annual Increment	9
8	Potential Mean Annual Increment	9
9	Regulation	10
10	Annual Allowable Cut	11/12
11	Available Operable Land, Technical Working Group Only	14
12	Sawtimber Harvesting Schedule	41
13	Pulpwood Harvesting Schedule	42
14	Reforestation Program Planned Planting Areas	45
15	Noncommercial Thinning Schedule	46
16	Fire Occurrence and Damage	47
17	Working Circle Inventory Data	56
18	Cu. Ft. Volume per Acre of Stems	58
19	Average Unmerchantability Factors	59
20	Ponderosa Pine Sawtimber Volumes	60
21	Douglas-fir and White Fir (Sawtimber Volumes)	61
22	Growth and Mortality	67
23	Ponderosa Pine Per Acre Volumes	69

LIST OF TABLES (continued)

Table	Title	Page
24	Allowable Annual Cut -- from Mill Blocks	71
25	Commercial Forest Types	74
26	Administrative Working Group	75
27	Commercial Forest Acreage -- Sustained Yield Unit	76
28	Acreage by Districts	77
29	Inaccessable Timber by Type	78
30	Tabular List of Road Needs	79
31	Commercial Available Forest Lands	80/81

II. SUMMARY OF PLAN

A. Management Objectives for the Working Circle

1. Background

Past management plans prescribed cutting practices which were designed to capture the mortality of the Working Circle. Essentially, these plans have been followed. There are some remaining pockets of virgin timber scattered throughout the Working Circle. These pockets have not been harvested in the past due to lack of access. To provide the maximum yield from the Flagstaff Working Circle in the future, more intensive management of each acre will be necessary.

2. Management Objectives

Objectives of management of the commercial forest lands on the Working Circle are to grow and harvest sawtimber and small forest products on a sustained-yield basis, give due consideration to both quality and quantity, and correlate the harvest with the principle of multiple use.

a. Specific Objectives

The principle objective of management is to obtain continuous quality production at a level as high as is economically possible without damaging the resource. Specific objectives to accomplish this are to:

(1) Apply even-aged management with cutting controlled by area with volume checks.

(2) Make the full annual allowable cut for each product available to the wood-using industries.

(3) Design stand prescriptions to obtain suitable management of the younger age classes (1-100 year age span) according to the site quality of the individual stand.

(4) Obtain prompt and complete regeneration on planned regeneration cut areas.

(5) Reforest burned areas, other nonstocked areas, and poorly stocked areas.

(6) Complete the initial harvest of all commercial virgin timberlands. These stands will receive the same type regeneration and intermediate cuts as will be prescribed for other stands instead of the mortality anticipation cut as was used in the past.

(7) Remove disease from the stands through sound cutting practices.

(8) Recover all usable dead or deteriorating timber as fully as possible. 1/

(9) Manage the commercial lands using compartments as management units.

(10) Attain a balance of twenty-year age classes by area and site quality.

(11) Reduce overstocked stands to the optimum basal area compatible with site quality.

(12) Increase understocked stands to optimum stocking through growth, planting, or direct seeding.

(13) Improve the quality of the stands through commercial thinning, through commercial intermediate cuts, and through regeneration from selected trees with the better genetic qualities.

(14) Complete and maintain the forest transportation system.

(15) Develop and utilize the timber resource as a leading example of the multiple use function.

b. Application

Attainment of these objectives can be reached by:

(1) Maintaining a current inventory of land and timber resources;

1/ A recent inventory indicates a high degree of mortality especially in the larger Keen's III and IV age classes. A concentrated effort will be made to capture this mortality through the use of small operators (gyppo) with the present mill operators furnishing the bulk of the "log market."

(2) Using the gathered data for use in preparing management plans and for determining the wisest use of available resources;

(3) Using approved and sound silvicultural and utilization practices.

B. Area and Volume Summaries
(Additional tables will be furnished as data becomes available)

1. Ownership Status (1961) (Flagstaff W.C. Only)

Table 1.

Ownership Class	All Lands	Commercial Forest Lands			
			Net Volume, Mbf		Net Volume
	Acres	Acres	Scribner	Internat'l ¼"	M Cu. Ft.
Coconino Nat'l Forest	1,801,091	793,513	3,552,396	4,085,256	850,369
Private	149,389	92,720	139,080/1	159,942/1	30,301/1
State	35,676	27,995	127,629	146,773	30,602
Other Government	13,348	7,960	23,880/1	27,462/1	5,202/1
Totals	1,999,504	922,188	3,842,985	4,419,433	916,474

/1 Estimated from timber type maps

2. County Summaries (1961) (Flagstaff W.C. Only)

Table 2.

County	All Lands Within Nat'l Forest Boundary	Net Nat'l Forest	Commercial Forest Lands, National Forest Only			
				Net Volume, Mbf		Net Volume
	Acres	Acres	Acres 1/	Scribner 1/	Internat'l ¼" 1/	M Cu.Ft 1/
Coconino	1,521,554	1,372,618	792,173	3,545,986	4,077,884	848,850
Gila	3,330	3,330	40	191	220	45
Yavapai	474,620	425,143	1,300	6,219	7,152	1,474
Totals	1,999,504	1,801,091	793,513	3,552,396	4,085,256	850,369

1/ Estimated from timber type maps

3. Commercial Forest Land, National Forest Only (Flagstaff W.C. only)

Table 3 .

Working Group or Condition Class	Acres	Sawtimber: Scribner Rule M Bd. Ft. 11.6"& Over	Sawtimber: International ¼" Rule M Bd.Ft. 11.6"& Over	Sawtimber: M Cubic Feet 11.6" & Over	Pole-timber 5-11.5" M Cu. Ft.	Total M Cu. Ft.
Operable Areas						
Technical	678,116	3,098,312	3,563,059	553,270	189,194	742,464
Administrative	23,479	107,276	123,367	19,156	6,551	25,707
Beaver Creek Watershed	7,728	37,084	42,647	6,622	2,156	8,778
City of Flagstaff Watershed	3,938	18,000	20,700	3,214	1,099	4,313
Subtotal	713,261	3,260,672	3,749,773	582,262	199,000	781,262
Aspen Type (T.W.G.)	6,645	No softwood volumes				
Arizona Cypress Type (T.W.G.)	11,903	No volumes known				
Subtotal Operable	731,809	3,260,672	3,749,773	582,262	199,000	781,262
Inoperable Areas						
Conifer Types	60,979	291,724	335,483	52,094	17,013	69,107
Aspen Type	725	No softwood volumes				
Subtotal Inoperable	61,704					
Total, Commercial	793,513	3,552,396	4,085,256	634,356	216,013	850,369

4. Other Forest Lands, National Forest Only (Flagstaff W.C. only)

Table 4 .

Land Class or Condition Class	Acres	Sawtimber: Scribner Rule M Bd. Ft. 11.6" & Over	Sawtimber: International ¼" Rule M Bd. Ft. 11.6" & Over	Sawtimber: M Cubic Feet 11.6" & Over	Pole-timber 5-11.5" M Cu. Ft.	Total M Cu. Ft.
Natural & Wilderness W.G.	1,810	8,700	10,005	1,554	505	2,059
Experimental Forest W.G.	5,980	39,928	45,917	7,130	1,668	8,798
Subtotal, Reserved Lands	7,790	48,628	55,922	8,684	2,173	10,857
Areas out of Production	31,832	No volumes				
Woodland (Pinon-Juniper)	540,537	No volumes				
Brush and Desert Chaparral	138,864	No volumes				
Grassland	288,555	No volumes				
Other (If any,explain)		No volumes				
Total, Other Forest Lands	1,007,578	48,628	55,922	8,684	2,173	10,857
TOTAL, Working Circle	1,801,091	3,601,024	4,141,178	643,040	218,186	861,226

5. Forest Lands by Forest Type, National Forest Only (Flagstaff W.C. Only)

Table 5.

Forest Type	Acres	Sawtimber		
		Scribner Rule M Bd. Ft. 11.6" & Over	International ¼" Rule M Bd.Ft. 11.6" & Over	M Cu.Ft. 11.6" & Over
Operable Areas				
Ponderosa Pine	707,259	3,230,662	3,715,261	576,904
Mixed-conifer	6,002	30,010	34,512	5,358
Aspen	6,645	No softwood volumes		
Arizona Cypress	11,903	No volumes known		
Subtotal, Operable	731,809	3,260,672	3,749,773	582,262
Inoperable Areas				
Ponderosa Pine	44,260	208,129	239,349	37,166
Mixed conifer	16,719	83,595	96,134	14,928
Aspen	725	No softwood volumes		
Subtotal, Inoperable	61,704	291,724	335,483	52,094
Total, Commercial	793,513	3,552,396	4,085,256	634,356
Reserved Areas				
Ponderosa Pine Wilderness W.G. Experimental Forest	1,810	8,700	10,005	1,554
	5,980	39,928	45,917	7,130
Total Reserved	7,790	48,628	55,922	8,684

6. Aspen Volumes 1/, (Flagstaff W.C. Only)

Table 6.

Forest Type	Sawtimber			Pole-timber	Total	
	Scribner Rule Bd.Ft. 11.6"or Over	International ¼" Rule Bd.Ft. 11.6"or Over	Cu. Ft. 11.6" or Over	Cu.Ft. 5-11.5"	Cu. Ft.	Cords
Aspen	53,160	61,134	1,129,650	1,860,600	2,990,250	33,225
Ponderosa Pine and Mixed Conifer	3,994,261	4,564,870	713,261	1,426,522	2,139,783	21,398
Total	4,047,421	4,626,004	1,842,911	3,287,122	5,130,033	54,623

1/ Estimate

C. Growth

1. Periodic Annual Increment 1/

Table 7.

Forest Type	Total Per Type			Weighted Per Acre Averages		
	MM Board Foot Net			Bd. Ft. Net		
	Scribner Rule	International ¼" Rule	Net M Cu. Ft.	Scribner Rule	International ¼" Rule	Net Cu. Ft.
Ponderosa Pine	73.226	84.210	17,352	107	123	25
Mixed-conifer	Not known					
Aspen	Not known					
Arizona Cypress	Not known					
By Working Circle	73.226	84.210	17,352	107	123	25

1/ Technical Working Group Only

2. Potential Mean Annual Increment

Table 8.

Forest Type	Total Per Type			Weighted Per Acre Averages		
	MM Board Foot Net			Bd. Ft. Net		
	Scribner Rule	International ¼" Rule	Net M Cu. Ft.	Scribner Rule	International ¼" Rule	Net Cu. Ft.
Ponderosa Pine						
Mixed-conifer						
Aspen						
Arizona Cypress	Not known					
By Working Circle						

D. Regulation

Table 9.

(Flagstaff Working Circle Only)

ITEM	WORKING GROUP				Summary
	Technical	Administrative	City of Flagstaff Watershed	Beaver Creek Watershed	
1. Control	Area (With volume checks)	Area (No volume check--may be by individual tree in forest camps and picnic grounds)	Area (No volume check this plan period)	Area (With volume checks; special areas may be excepted from area control for research purposes)	
2. Cutting Period					
Sawtimber	20 years	20 years	20 years	20 years	
Pulpwood	10 years	10 years	10 years	10 years	
3. Rotation Age	110 years	190 years	150 years	110 years	
4. Rotation Period	120 years	200 years	160 years	120 years	
5. Acres to be entered or cut per yr.	33,906	1,174	197	387	35,664
6. Acres to be regenerated per year	5,651	118	25	65	5,859
7. Acres to be regenerated per cutting period	113,020	2,348	493	1,288	117,149
8. Acres of aspen to be cut per yr.	332	--	--	--	332
9. Acres to be examined or cut for pulpwood per year (This acreage is not part of the control acreage for area regulation)	67,812	2,348	393	773	71,326

E. Allowable Cut and Cutting Limitations

1. Annual Allowable Cut (Flagstaff W.C. Only)

Table 10 .

Item	CUTTING METHOD						Total
			Regeneration				
	Inter-mediate 1/	Salvage	Group, patch, strip, stand	Shelterwood or Seed Tree		Selection	
				Preparatory & seed 2/	Removal		
Regulated area to examine (acres)	xxx	xxx	xxx	xxx	xxx	xxx	79,352
Aver. No. of Com-parts. to examine.	xxx	xxx	xxx	xxx	xxx	xxx	90
Est. aver. area to cut (A.) Not Reg.	71,326 3/	606,271 3/	xxx	xxx	xxx	xxx	677,597 3/
Area Reg.	332	xxx	xxx	29,805	5,859	xxx	35,996

ESTIMATED AVERAGE YIELD

SAWTIMBER (Mostly 18.6" and over d.b.h. - includes 11.6"-18.5" d.b.h. with Grade IV or better butt log)

Scribner rule MMBM	xxx	xxx	xxx	26.666	28.029	xxx	54.695
Internat'l. 1/4" MMBM	xxx	xxx	xxx	30.666	32.233	xxx	62.899
MM Cubic feet	xxx	xxx	xxx	4.762	5.005	xxx	9.767

4/ SAWTIMBER (11.6"-18.5" d.b.h. with no butt log better than Grade V)

Scribner rule MMBM	xxx	xxx	xxx	10.534	xxx	xxx	10.534
Internat'l. 1/4" MMBM	xxx	xxx	xxx	12.114	xxx	xxx	12.114
MM Cubic feet	xxx	xxx	xxx	1.881	xxx	xxx	1.881

Summary: Scribner rule MMBM - 65.229
Internat'l. 1/4" MMBM - 75.013
MM Cubic Feet - 11.648

OTHER PRODUCTS

- Pulpwood - (5.0"-11.5" d.b.h.)

MM Cubic feet	4.286	xxx	xxx	xxx	xxx	xxx	4.286
M cords	48.000	xxx	xxx	xxx	xxx	xxx	48.000

-Poles - (Included with sawtimber)

MM Cubic feet	xxx	xxx	xxx	xxx	xxx	xxx	xxx
M cords	xxx	xxx	xxx	xxx	xxx	xxx	xxx

- Aspen -

MM Cubic feet	0.054	xxx	xxx	xxx	xxx	xxx	0.054
M cords	0.600	xxx	xxx	xxx	xxx	xxx	0.600

Summary: MM Cubic Feet - 15.934
M Cords- 178.458

UNREGULATED ADDITIONAL CUT OBJECTIVE

5/ - Sawtimber - (11.6" and over d.b.h.)

Scribner rule MMBM	xxx	9.087	xxx	xxx	xxx	xxx	9.087
Internat'l. ¼" MMBM	xxx	10.450	xxx	xxx	xxx	xxx	10.450
MMCubic Ft.	xxx	1.623	xxx	xxx	xxx	xxx	1.623
M cords	xxx	19.094	xxx	xxx	xxx	xxx	19.094

- Other Products -

MM Cubic Ft.	xxx	xxx	xxx	xxx	xxx	xxx	xxx
M cords	xxx	xxx	xxx	xxx	xxx	xxx	xxx

NON-CONVERTIBLE PRODUCTS

- Christmas trees -

No. of trees	28,000	xxx	xxx	xxx	xxx	xxx	28,000

1/ Includes release

2/ Includes partial

3/ Not included in area regulation

4/, 5/ See the following page

4/ This allowable cut is available only if harvested from the stem sizes 11.6" - 18.5" d.b.h. This wood is on stems that are to be taken from the young sawtimber size stands as thinners and toppers. This will be done to improve the spacing of the trees in the stands. When the stands are thinned to optimum basal area requirements, increased growth on the residual stems will take place. The allowable cut volume established for this size and kind of material is not inter-changeable with the other sawtimber size allowable cut.

5/ This unregulated material is available only if recovered from areas on the Forest which are not currently included within a going timber sale. This is material that will be harvested from trees that have recently died and are still sound or from trees that have been successfully attacked by a killing agent. It is planned that this material be recovered by small woods operators who have simple, mobile equipment that can move easily from one place to another. The logs recovered would probably be resold to the major sawmill operators in the area. This unregulated allowable cut is not interchangeable with the "live" tree allowable cuts. This allowable cut may be recovered from any of the four major working groups; Technical, Administrative, Beaver Creek Watershed, and City of Flagstaff Watershed. This includes roadside zones.

2. Cutting Limitations

By the end of Fiscal Year 1972 the cut for the 10-year period may not have exceeded the allowable cut for the decade.

"These rates, (allowable cut) except at the discretion of the Regional Forester, may not be exceeded by more than 15% in any one calendar year, nor may the cumulative cut for the consecutive 5-year period . . . exceed the total allowable cut for that period by more than 5%." (Federal Unit Policy Statement, Par. II. 2).

If during any year harvesting fails to equal the budget, the undercut may be made up during any subsequent year or years of the decade.

Should timber cutting not equal the budgeted amount by the end of the decade, the undercut will not be considered as a carry-over available for cutting during the following year. Cutting budgets for the year 1973 and following years will be fixed by the revision of the management plan in 1972.

F. Plan Revision

This plan will be revised prior to 1973.

Annual revisions will be made as needed by the Forest Supervisor for approval by the Regional Forester on action items.

G. Coordination With Other Uses

This plan has been prepared in accordance with the multiple use coordination policies outlined in FSM 2405. District multiple use plans and other multiple use guides were taken into consideration during preparation of this plan.

IIa. SUMMARY - Flagstaff Federal Sustained Yield Unit

A. Description

1. Definition

"A Federal unit is an area of federally owned or administered land under the jurisdiction of the Forest Service . . . . . established to maintain a stable community or communities . . ." (9)

2. Relation to Flagstaff Working Circle

a. The boundaries of the Federal Sustained Yield Unit and Flagstaff Working Circle do not coincide (see map in front of plan). In order to understand the acreage and volume figures in this plan it must be understood that:

(1) Most of the commercial forest acreage and volume is encompassed by the Federal Unit lying within the Working Circle boundary.

(2) There are 12,490 operable acres outside the Federal Unit, but within the Working Circle boundary.

(3) There are 6,238 operable acres within the Federal Unit outside the Flagstaff Working Circle boundary. This land is a portion of the Kaibab National Forest, Williams Working Circle.

b. Available, Operable Land - Technical Working Group Only

Table 11 .

Description	Acres	% of Total	Acres Cutover Per Year	Acres Regenerated Per Year
Working Circle plus Federal Unit	684,354	100.00	34,218	5,703
Working Circle Only	678,116	99.09	33,906	5,651
Federal Unit Only	671,864	98.17	33,593	5,599

B. Policy Statement

"Except as otherwise provided by the Regional Forester to meet emergencies, not less than 85 percent of the sawtimber sold from normal harvesting and intermediate or light improvement cuts in the Unit must be given primary manufacture within the Flagstaff community, which is defined as the City of Flagstaff and the area within three miles thereof." (4)

C. Designated Operators

1. Sawtimber

Designated Allowable Cut Descriptions

Regulated A - Sawtimber mostly 18.6" and over d.b.h. Includes 11.6" - 18.5" d.b.h. with Grade IV or better butt log.

Regulated B - Sawtimber 11.6" - 18.5" d.b.h. with no butt log better than Grade V.

Regulated C - Sawtimber 11.6" and over d.b.h. -- proportionate share of the Williams Working Circle, Kaibab National Forest portion of the Flagstaff Federal Sustained Yield Unit (6,238 acres commercial Forest land).

Unregulated Salvage - Sawtimber 11.6" and over d.b.h. Includes dead trees with sound wood and trees which have been successfully attacked by a killing agent.

Regulated D - Pulpwood 5.0" - 11.5" d.b.h.

Designated Operator	% of Fed. Unit Allowable cut	Designated Volume (Mbf Scribner)	Designated Allowable Cut
Flagstaff Federal Sustained Yield Unit			
Sold Under Regulation S-4			
Southwest Forest Industries, Inc.		42,000	Regulated A
		8,000 1/	Regulated B
		527	Regulated C
		50,527	Total Regulated
		6,932 2/	Unregulated Salvage
		57,459	Total available

Designated Operator	% of Fed. Unit Allowable cut	Designated Volume (Mbf Scribner)	Designated Allowable Cut
Flagstaff Federal Sustained Yield Unit			
Sold Under Regulation S-4			
Whiting Brothers		4,103	Regulated A
		831[1]	Regulated B
		55	Regulated C
		4,989	Total Regulated
		720[2]	Unregulated Salvage
		5,709	Total available
Total Designated		46,103	Regulated A
		8,831[1]	Regulated B
		582	Regulated C
		55,516	Total Regulated
		7,652[2]	Unregulated Salvage
	85%	63,168	Total available
Sold Under Regulation S-6			
No Designated Operator		8,136	Regulated A
		1,558[1]	Regulated B
		102	Regulated C
		9,796	Total Regulated
		1,351[2]	Unregulated Salvage
Total Undesignated	15%	11,147	Total available
Total for Federal Unit			
		54,239	Regulated A
		10,389[1]	Regulated B
		684	Regulated C
		65,312	Total Regulated
		9,003[2]	Unregulated Salvage
		74,315	Total available

(Continued)

Designated Operator	Designated Volume (Mbf Scribner)	Designated Allowable Cut
Areas of Working Circle Outside Flagstaff Federal Sustained Yield Unit - Sold Under Regulation S-6		
No Designated Operator	456 1/	Regulated A
	145 1/	Regulated B
	601 2/	Total Regulated
	84 2/	Unregulated Salvage
	685	Total available
Totals Available on Flagstaff Working Circle plus the Williams Working Circle, Kaibab National Forest, portion of the Flagstaff F.S.Y.U.		
	54,695 1/	Regulated A
	10,534 1/	Regulated B
Total Flagstaff Working Circle	65,229	
Williams W.C., Kaibab N.F., Flagstaff F.S.Y.U.	684	Regulated C
	65,913 2/	Total Regulated
	9,087 2/	Unregulated Salvage
	75,000	Total available - Sawtimber
	24,000	Regulated D - Pulpwood
	99,000	Total available - All sizes

1/ This allowable cut is available only if harvested from the stem sizes 11.6" - 18.5" d.b.h. This wood is on stems that are to be taken from the young sawtimber size stands as thinners and toppers. This will be done to improve the spacing of the trees in the stands. When the stands are thinned to optimum basal area requirements, increased growth on the residual stems will take place. The allowable cut volume established for this size and kind of material is not interchangeable with the other sawtimber size allowable cut. This material may be used for either sawtimber or pulpwood, but not for both.

2/ This unregulated material is available only if recovered from areas on the Forest which are not currently included within a going timber sale. This is material that will be harvested from trees that have recently died and are still sound or from trees which have been successfully attacked by a killing agent. It is planned that this material be recovered by small woods operators who have simple, mobile equipment that can move easily from one place to another. The logs recovered would probably be resold to the major sawmill operators in the area. This unregulated allowable cut is not interchangeable with the "live" tree allowable cuts. This allowable cut may be recovered from any of the four major working groups; Technical, Administrative, Beaver Creek Watershed, and City of Flagstaff Watershed. This includes roadside zones. This material may be salvaged from the 606,271 unregulated acreage annually.

2. Other Designated Products

Designated Operator	Products	Designated Annual Volume	
		Cords	Mbf.
Sno-Fluff Excelsior	Aspen	600	
Ponderosa Paper Products Co., Inc.	Pulpwood	16,500	8,250

D. Carry-over

An amendment dated August 13, 1959, to the previous management plan provided for a 14,000 M carry-over for Southwest Forest Industries, Inc. This carry-over has been harvested since July 1, 1963.

III. INTRODUCTION

A. The Coconino National Forest

1. Location

The Coconino National Forest is located in the north-central portion of Arizona, within the Verde and Little Colorado drainages. The Forest comprises a portion of the largest continuous body of ponderosa pine in the world.

2. Characteristics and Use

a. Transportation

Transportation into Flagstaff, the Forest Headquarters, is adequately provided by the main line of the Santa Fe Railway and transcontinental highways running north and south and east and west. One commercial airline also serves the area.

b. Fire

The fire occurrence, mostly lightning-caused, is very high. The average annual number of lightning-caused fires was 386 for the past eight years.

c. Recreation

Nationally-known Oak Creek Canyon and other recreation areas within the Forest, are receiving increasingly heavy recreation use. This is due to the nearly completed, paved highways which connect these sites with the heavily populated areas.

d. Animals

The Forest is grazed by sheep, cattle, and horses. Wildlife which dwell in the Forest include deer, elk, antelope, turkey, the Abert squirrel, and others. Livestock grazing is seasonal (normally five months) within most of the timbered area.

B. The Flagstaff Working Circle

1. Description

The Forest contains 1,999,504 acres within its boundaries. Of this, 1,801,091 acres are under the jurisdiction of the Forest Service. The Flagstaff Working Circle is the National Forest land within the Forest boundary. It is divided into seven blocks of about equal size. These blocks presently coincide with the Ranger District boundaries. The 793,513 commercial-timbered acres lie mostly upon the high Colorado Plateau which crosses the Forest diagonally from northwest to southeast. Some timber is located on each of the Ranger Districts.

2. History

A complete history of the Working Circle is in the files, hence but a brief summary here.

a. Timber removal commenced along with the coming of the railroad in the 1880's.

b. The San Francisco Forest Reserve was established in 1898 under the Forest Reserve Act.

c. The first Timber Management Plan was written in 1911. This sixth revision of the original plan indicates the need for some changes in our management practices.

d. The earlier plans were based on heavy cuts, long cutting cycles, and a rotation of 150 years or more. The 1947 and 1953 revisions indicated the need for a light removal on the previously heavily cutover area on the north end of the Forest. The control was by area. It was also predicated on a lighter cut from the remaining virgin timber to more nearly capture the mortality. This was done by removing the percentage guarantee from the sales contracts. The harvest cut on the virgin acres of the Working Circle is rapidly nearing completion. More intensive management practices will be necessary during the period of this plan to obtain the ultimate in growth and production of sawtimber and related products.

3. Recent Happenings

a. On February 28, 1957, the Colorado Plateau pulp sale covering parts of five forests was signed. The first carload of pulp was shipped in January of 1961 after the pulp plant at Snowflake, Arizona, was opened in late 1960 by the Southwest Forest Industries, Inc.

b. In 1960, Southwest Forest Industries also established a wood-treating plant in Prescott, Arizona, with the bulk of the raw material coming from National Forest lands of the Prescott National Forest. Due to the shortage of the longer length material available there, a market has now developed for 35' and longer poles here on the Flagstaff Working Circle.

4. Trends

The public demand for Christmas trees and other small wood products for individual use continues to increase at about the same rate as does the increase in population. The prices bid on these products continue to go up even when the sawtimber market is "soft." The demand for the commercial-type sale continues along on about an even keel.

5. Present and Future

To make room for progress, timbered land is being taken out of production continuously through the construction of highways, power transmission and gas lines, and other special uses. To offset the loss of productive acres, it is necessary to assure more and better growth on the remaining sites through the application of more intensive timber management practices.

C. The Federal Sustained Yield Unit

The Federal Sustained Yield Unit (hereafter referred to as the Federal Unit) was established in 1949. It includes the vast majority of the commercial-timbered acres of the Flagstaff Working Circle. The Federal Unit also includes some 6,238 commercial acres within the boundaries of the Kaibab National Forest in the Williams Working Circle along their east boundary. Timber removal from this area is to be reported under Federal Unit controls. The policy statement for the Federal Unit requires manufacture of at least 85% of the sawtimber allowable cut within three miles of the City of Flagstaff. The remaining 15% is to be sold to the highest bidder without regard to the point of manufacture except that approved designated operators are not to compete without Regional Forester authorization.

D. Stand Characteristics

1. Ponderosa Pine Type

This type exists in an almost pure form on the Working Circle, but within the type there are these associated species: Douglas-fir, white fir, Gambel oak, limber pine, and pinon pine. Ponderosa pine occurs mostly between 5,500 feet and 8,500 feet in elevation.

At the lower elevations and on poor sites the pine occurs in isolated or scattered stands. Here the limiting factor is largely available moisture. Pine stands are limited to sandy or gravelly soils (2) or other situations where moisture conditions are favorable. More favorable ponderosa pine establishment can be obtained in the lighter soils because root penetration is easier, rapid, soil moisture relationships are more favorable, and competing vegetation is at a disadvantage on such sites.

At the higher elevations and on the more moist sites, soil texture, structure, and depth become less restrictive. "Heavier soils like clay-loam are associated with highest site qualities, provided they have adequate moisture and drainage." (2)

Much of the unit has an overburden of broken "malpais" (basalt) covering its soils. Solid lava flows are confined to a limited area within the Cinder Hills. A small portion of the timber sites are covered by black cinders. Red and yellow cinder sites are also present. These sites are mostly in the northern half of the Forest. On the black cinder sites reproduction does not become established easily. The clay soils underlying all three cinder types are very fertile and established reproduction grows rapidly (though much of it is of poor form).

The majority of the soils on the Forest are derived from igneous material which forms heavy clay-loams. These soils pack readily and become boggy when wet. About one-fourth of the soils are sandy-loams derived from sedimentary parent material.

Natural reproduction is obtained most easily on the sandy loams, is more difficult to obtain on the clay soils, and is extremely difficult to obtain on the black-cindered sites. Where moisture is limited, soil texture and structure seem to be of more importance than soil composition.

More specific information about soils on particular areas can be found in the District Multiple-use Management Plans and from soil survey maps and reports. Management of the timber resource will be increasingly correlated with soils information as it becomes available.

Site indexes on the Flagstaff Working Circle range from 40- to 80+. This range of site indexes has been broken down into three broad site quality classes for management purposes as follows:

Site Class	Site Quality	Site Index Range	% of Area
I	High	68 and up	14.6
II	Medium	53-67	62.7
III	Low	52 and under	22.7

Cultural treatments, planting, and seeding will be based on site. A site index- site class graph is located in the appendix.

2. Mixed-conifer Type

The mixed-conifer type comprises only about one percent of the commercial forest volume. Mixed-conifer areas are located on the south end of the Forest along the Mogollon Rim; on Hutch, Mormon, and Mahan Mountains; on the San Francisco Peaks; and, on other moist, cool sites. Species included are white fir, Douglas-fir, ponderosa pine, Engelmann spruce, corkbark fir, limber pine, and other species. Most species in this type are more tolerant than ponderosa pine. Also, on the moist, cool, shady sites, some species in this type are much more aggressive than ponderosa pine.

3. Aspen Type

The aspen type is in small stands throughout the Forest, the largest of which are found on the northwest slopes of the San Francisco peaks.

4. Other Types

Other minor commercial types present include the Arizona cypress type and the spruce-fir type.

There are some 11,903 acres of Arizona cypress on the Forest. These acres have not been reported previously.

E. Past Accomplishments

1. Land Ownership Changes

During the past decade there have been no exceptionally large land exchanges, hence no great changes in the total acreage pattern have taken place. Some 72,031 commercial forest acres have been added. The last timber management plan listed acreage of sawtimber size class only, and it did not include the commercial forest acreage outside the Federal Unit boundary. (This plan considers all timber size classes). It is possible that the "Aztec" lands may be acquired within the next 10 years.

2. Land Taken Out of Production

While every effort has been made to hold to a minimum the land permanently taken out of timber production while meeting other demands, the impact has been significant. Where possible, rights-of-way and other large special uses have been diverted to those areas where the least amount of commercial timber producing land is involved. Nevertheless, 31,832 commercial forest acres have been removed from production within the Working Circle.

3. Timber Stand Improvement

The following is a tabulation of pruning and thinning accomplishments 1953-1962:

	Acres	
C.Y.	Pruning	Thinning
1953	8,038	--
1954	8,281	--
1955	6,763	--
1956	7,828	--
1957	7,343	1,192
1958 (First Half)	2,068	478
F.Y.		
1959	7,021	3,921
1960	6,029	4,555
1961	2,420	5,629
1962	779	6,125
Total	56,570	21,900

Thinning now has top priority.

4. Planting and Seeding

Reforestation over the past 10 years has been mostly experimental planting with variations of success. Up to July 1, 1962, 1,179 acres had been planted successfully, and 152 acres had been seeded successfully. Reforestation experiments done include machine planting, transplanting native stock, rock mulching, and direct seeding. It is now believed that artificial regeneration can be successful, though it may be costly at times.

5. Insect and Disease Control

There have been several insect infestations during the past decade. Outbreaks occurred in white fir on the south end of the Forest, in Douglas-fir on Mormon Mountain, and in other fir areas. The method of control used consisted of salvaging merchantable material and piling and burning the slash. Inspection indicates a possible need to clear cut the white fir to finally solve the problem.

6. Small Forest Products

Due to the lack of a market for small forest products, the last plan revision included only sawtimber types as commercial forest land. Increased demand in the past few years has resulted in the development of a pulpmill and a pole-treating plant--both operated by Southwest Forest Industries, Inc. This now enables the Forest to manage for small forest products.

IV. PROBLEMS

A. Watersheds

Several important watersheds are located on the Coconino National Forest -- Beaver Creek, Mormon Lake, Lake Mary, and the Flagstaff Municipal (Inner Basin) Watersheds. Cutting on the Beaver Creek Watershed is regulated by a Board of Control consisting of representatives of the National Forest administration and research branches. (See discussion of the Beaver Creek Watershed Working Group in Section V.) The Flagstaff Municipal Watershed is managed under the Act of May 28, 1940. (Further information is filed in the Supervisor's Office.)

B. Mining

There are 13 patented mining claims within the Working Circle. The Materials Disposal Act of July 23, 1955, decreased the periodic impacts of mining claim locations; however, claims on common mineral varieties are still being staked occasionally. The changing economics of minerals such as manganese will account for periodic spurts of mining activity.

C. Grazing

All of the technical Working Group is within grazing allotments. Livestock and wildlife interference with natural and artificial regeneration has been noted in many areas in recent years. It is very apparent that there is a need for positive action to prevent this damage by the use of rotation grazing, fencing, or spraying with repellents. The treatment should continue until the young trees are above browse height.

V. MANAGEMENT PRESCRIPTION

A. Silvicultural Systems, Rotations, and Cutting Methods

1. Technical Working Group

The operable portion of the Technical Working Group consists of 678,116 acres. The virgin timberland should be cut over within the first few years of this plan. This working group contains only those areas of commercial forest land that are available for full timber utilization.

The goal is to produce a balanced, even-aged working group. Ideally, 1/120th of the area would be reproduced and 1/20th of the area would be treated each year. The actual balance of age classes on the operable acreage of the Working Circle (1961 inventory) can be found in the appendix.

The rotation period for this working group will be 120 years. The rotation age will depend upon how soon reproduction is established. A five-year period is allowed for natural reproduction to restock the planned regeneration areas. A maximum of 10 years is allowed for establishment of adequate reproduction.

Since the aim is even-aged management, regeneration cuts will be one of three general systems. (See FSM 2471)

a. Seed-tree method
b. Shelterwood method
c. Group, patch, strip, or stand cutting in rare instances.

(1) Definition: Intermediate cuts pertain to treatment of the stand during the portion of the rotation not included in the period of regeneration. (See FSM 2471.4)

(2) Intermediate cuts include:

(a) Cleaning
(b) Thinning
(c) Release or improvement cuts (liberation)
(d) Salvage cuts
(e) Sanitation cuts
(f) Risk cuts

2. Administrative Working Group

The Administrative Working Group is made up of roadside zones, streamside zones, trailside zones, waterfront zones, administrative sites, recreation areas and sites, geologic areas, archeological areas, landscape areas, and other similar areas.

The district multiple use plans contain the guidelines which govern treatment on most of these areas. Stand treatment will be correlated with the various uses through the use of these guidelines.

The rotation period has been extended to 200 years for this working group. This provides: for the retention of trees of large size and trees with features that give them "character"; for a smaller yearly regeneration acreage; and, for less frequent change of the vegetative cover.

Even-aged management will be used. The silvicultural system will be the seed-tree and shelterwood methods. On recreation sites the planned regeneration area may be designated as that area occupied by a single tree or a small group of trees. Over the entire range of the administrative working group, ten 20-year-age classes will be established. A balance of acreage by age classes will be attained.

Intermediate cuts will be made in conjunction with intermediate cuts on the adjoining acreage of the Technical Working Group.

3. Beaver Creek Watershed Working Group

All of the Beaver Creek drainage and its tributaries (250,000 acres) are included in an intensive pilot test involving control and manipulation of vegetation to test effects on downstream water yield and water quality. Most of the commercial forest land included in this watershed is managed as a part of the Technical Working Group. It is necessary to schedule cutting of each portion of the watershed to fit the timing and prescription of planned treatments.

Of the 82,000 acres of commercial forest land within the watershed, 7,728 acres are designated as the Beaver Creek Watershed Working Group. Twelve small intermediate watershed units are included in this acreage.

4. City of Flagstaff Watershed Working Group

This working group is the Flagstaff Municipal Watershed which is managed under the Act of May 28, 1940. There are 3,938 commercial acres in this group. Currently, the stands in this working group are receiving no treatment.

Compartment examination and stand prescriptions along with volume inventory will be done before any stand treatment is programmed. Multiple use correlation will be precisely outlined. Stand prescriptions will be of sufficient detail so that the public relation impact is considered. The effect of each treatment on the land, on the wildlife habitat, and on the scenic values of the area will be fully considered and shown to be the reasonable, justifiable manipulation of that stand.

The rotation age will be 150 years and the rotation period 160 years. The cutting period will be 20 years. Even-aged management will be used.

The silvicultural system may be seed-tree, shelterwood, or patch cutting. The system used will be selected according to the needs of the individual stand coupled with the multiple use correlation needs of the stand.

5. Experimental Forest Working Group

This working group is managed by the research branch with appraisal and sale preparation by the Forest when so requested. Volumes so harvested are not considered as a portion of the working circle allowable cut.

6. Natural and Wilderness Working Group

There is no harvesting of timber from the land in this working group. Included here is the Sycamore Wilderness Area, the West Fork of Oak Creek Natural Area, and the Peaks Natural Area.

B. Special Treatments

1. Treatment of Recreation Areas (17)

These areas will be managed as a part of the Administrative Working Group.

On the areas classified for recreation use, timber will be managed so that it will provide a pleasing forest setting. This can be attained by managing the stands for varied age classes. Also, this type of management will provide for continuous replacement by vigorous trees capable of withstanding insects, disease, and soil compaction. Commercial sales, insofar as possible, will be used to harvest safety-hazard trees and sanitation and risk trees, as the initial period cut.

If necessary, regeneration will be done by planting, by direct seeding, or by other methods, to secure the stocking needed for recreation purposes.

Young stands will be thinned to promote rapid growth and large trees for aesthetic purposes. These young, vigorous trees will thus replace the diseased and decrepit trees which are often threats to public safety.

Harvest of rotation-age trees during succeeding cutting periods will provide for orderly replacement. Older trees may be retained if they are healthy or if they do not constitute a hazard to the public and are needed to maintain aesthetic values.

The cutting period, for the purpose of organization, is established at 20 years. Intermediate selective removals may be made as necessary to salvage mortality until the desired distribution of age classes is present. Juniper, pinon, and hardwoods will be exceptions to rotation planning.

a. Stands on sites and/or areas reserved and developed for intensive recreation use.

Planners of the Division of Timber Management and Recreation and Lands Management will jointly prepare an action plan to provide replacement trees for recreation use areas. Eighty years of optimum growth will be needed to culture trees to a size desirable for recreation purposes. Therefore, the plan will be made from an inventory which identifies those trees which will need to be replaced during the next four cutting periods.

All trees above the 120-year age class will be so identified, in addition to safety-hazard trees and sanitation and risk trees. Trees below the 120-year age class can be considered as replacements if they are healthy and are either free to grow or can be released. The plan will make provisions for thinning, pruning, and planting to culture desirable replacements.

Pruning will often require special criteria and technique. Pruning for stand sanitation will be done as required to maintain a healthy, productive stand. Other pruning should be done on a plan-wide basis in order to gain a variety of views, or for other purposes of recreation and timber-resource management.

b. Stands on sites and/or areas designated for recreation but not yet developed.

These are potential sites and should be treated by commercial sales at the earliest opportunity. The desired stand age at time of development for recreation should be 120 years and younger, with distribution through the younger age classes. Therefore, new recreational developments should be made in stands 120 years of age and younger. Trees over 120 years old may be retained if they are healthy or if their retention is desirable to improve the overall aesthetics of the area.

c. Stands on lands designated for limited recreation management, such as buffer zones, roadside zones, and waterfront zones, where cutting is permitted.

when did area regulation become a management system ? RH

Area regulation is the desirable management system to use. The objective will be to maintain a normal distribution of age classes. The optimum situation would be to have one-tenth of such recreation land in each of the 20-year cutting periods. This will require timbertype classification of the stands by age classes. Once the type and area by age class are known, management should be aimed toward making up any deficiencies in the age classes. At the same time, each stand should be treated according to its silvicultural needs.

Silvicultural treatment will be:

(1) Artificial regeneration where necessary to complete the stocking needed for recreation use.

(2) Thinning, to culture younger age class trees into large size trees. Thinning to open up the roadside screen and give depth to the view under crowns of existing trees.

this is a switch, but a good one ! RH

(3) Removal of safety-hazard trees and sanitation and risk trees.

(4) Harvest-cut trees, either singly or in groups, that are over rotation age. This will release younger stands, create openings of a fraction of an acre where regeneration is needed, and will provide for orderly replacement by younger age classes.

(Treatments (2), (3), and (4) should be done in the nonrecreational season.)

The remaining forested lands not specifically designated for recreation purposes receive more recreation visits than any other for purposes of viewing fall coloring, hunting, fishing, and enjoying the forest environment. All presale prescriptions should consider aesthetics such as the reservation of some aspen stands on hillsides, the arrangement of regeneration areas, the protection of meadows, the reduction of roadside logging slash and debris, and similar practices. Refer to other guidelines in FSM 2405.

2. Treatment of Dwarfmistletoe-Infected Stands

There are some 150,000 dwarfmistletoe-infected acres within the working circle. Control on these acres will require special treatment. Forest standards for this treatment have been prepared and are filed in the Supervisor's and each Ranger District office.

3. Treatment of Gambel Oak

Quercus gambelii is abundant on the working circle. Sprouts will be favored for utilization by browsing animals and identifiable producers will be favored to produce mast for wildlife food. Decadent stems will be removed in order to make room for reproduction.

C. Noncommercial Thinning, Release Cutting, and Precommercial Cleaning.

Some one-quarter million acres on the working circle are in need of noncommercial thinning and release cutting. This program has been initiated and thinning has been accomplished on 22,000 acres. Stands will be cut to the prescribed basal areas and/or stems per acre guide as shown in the Regional thinning guides. (FSH 2474.3, R-3 Supplement No. 173.)

D. Commercial Thinning and Pulpwood Cutting

The objective of commercial thinning is to reduce the stand density by utilizing cut material and by leaving a residual stand basal area which is determined to be optimum for its site index and age class.

At the present, material from the south one-half of the working circle is under contract for the new pulpmill at Snowflake, Arizona. An intensive inventory of the area is currently underway.

A "wood yard" has been recently established at Flagstaff to provide an outlet for pulpwood taken from rights-of-way and experimental areas. This also provides an outlet for materials from State and private lands.

E. Cutting of Other Products

1. Christmas Trees

As the compartment examination program progresses, an accurate inventory of areas suitable for growing Christmas trees will be prepared and appended to this plan.

2. Utility Poles

Within the pulpwood area there is a percentage of stems suitable for the more valuable product, utility poles, especially of the longer lengths. The volume represented is a part of the sawtimber annual allowable cut.

3. Aspen

There are 6,645 acres of nearly pure aspen stands scattered throughout the Forest. There is no current inventory of these stands. Compartment examination and measurement will be the basis for preparing a detailed production and harvest budget for appending to this plan. Past estimates indicate an allowable cut of 600 cords annually.

ACTION PLAN

Timber Management Plan (July 1, 1963 through June 30, 1972)

Flagstaff Working Circle

Sections VI, VII, VIII, and Maps

Working Circle Plan Prepared by:
Norman E. Johnson, August 1, 1963

Review and Revision Control Schedule

Fiscal Year		Forest Supervisor			Regional Forester
		Reviewed By	Revised By	No Revision Needed	Approved By
1964	Name				
	Date				
1965	Name				
	Date				
1966	Name				
	Date				
1967	Name				
	Date				
1968	Name				
	Date				
1969	Name				
	Date				
1970	Name				
	Date				
1971	Name				
	Date				
1972	Name				
	Date				

VI. MANAGEMENT CONTROLS

A. Inventory

The original inventory was made during the period 1951-1952. Four hundred fifty-two (452) plots were selected at random over the entire Forest and pinpricked on the 1949 photos. The ¼-acre plot centers were marked on the ground with a steel stake and witnessed by two trees that were blazed and painted with a white band. Data was tallied on form R3 2400-49. All sawtimber trees on the ¼-acre plots were measured to the nearest one inch and to the nearest ½ log. These were tallied as cut and leave. Poles were tallied in one-inch diameter groups on a 1/10-acre plot and reproduction counted and recorded on a 1/50-acre plot.

The reinventory was done during the late summer and fall of 1961. Of the 452 original plots, 394 were found and remeasured. The remaining 58 plots were either mispricked on the original photos or the original photos were lost during the past 10 years. Relocation was done with the old and new photos. No problems were encountered in relocation where the plots were correctly pricked.

For the reinventory two new procedures were used. First, the plot data was recorded on IBM cards in the field, and second, a 10-point prism cruise was used on 110 of the original plots. All of the data recorded on the original inventory was retaken plus considerable additional information needed for more intensive management. (See card samples in appendix.) Time taken to record on the IBM cards compared favorably with the old plot sheet method of recording data.

After measurement of the ¼-acre plot at each of 110 special plots, the plot center was used as the first of 10 points for a prism cruise. (See appendix for 10 point layout.) This was treated as a separate plot and the IBM cards were kept apart from the ¼-acre plot cards. Information taken on the 10 points was identical in nature to the ¼-acre plot.

On all the 110 special plots, the trees on the original ¼-acre plots were all numbered with aluminum tags.

In the future it is planned to remeasure each ¼-acre growth plot as it is found in a compartment during compartment examination. Each growth plot will be recorded, re-established, and otherwise handled according to current standards and procedures. A general remeasurement of all the recoverable ¼-acre plots is planned for F.Y. 1967. This remeasurement will provide data needed to provide much needed growth rates. The Flagstaff Municipal Watershed and the Arizona cypress type will be inventoried at this time.

B. Compartment Examination and Multiple-use Prescriptions

1. General

The seven Ranger Districts (blocks) of the Forest were subdivided into 5,000 acre compartments in 1961. A job already under way is the further subdivision of these units into compartments of a more manageable size (1,000 to 5,000 acres). This work will be concentrated on future timber sale areas so that management prescriptions by compartments can be prepared in advance of the actual timber sale.

Stands will be classified according to age class, basal area, site quality, forest type, and stand category. Data for all uses will be collected and prescriptions for timber stands will be coordinated with all uses.

The order of examination will follow the Cutting Budget. Examination has begun in 1963 on areas to be cut in 1965. A schedule of compartment examination will be appended to this plan.

2. Compartment Management Steps

a. Determine the area to be examined.
b. Make the examination and the inventory.
c. Analyze the data. Consider the alternatives.
d. Write the prescription. Give the treatments a priority.
e. Carry out the prescription.

C. Regeneration Controls

In regeneration-cut areas and in understocked areas, every feasible attempt will be made to encourage natural regeneration. It will be necessary to establish specific controls so that reproduction is definitely obtained on planned regeneration areas.

1. Plans for regeneration controls should be made at least three years in advance of cutting. The regeneration area should be outlined on a compartment map and treatment prescribed to establish regeneration. The location of the area should be given to the Supervisor at least three years before regeneration activities. In coordination with other uses. the Forest Supervisor will establish adequate protection measures for the regeneration areas. Measures for protection from grazing by domestic stock, wildlife, and rodents

will be provided. This protection will be continued until reproduction has become established above browse height. Guidelines are provided in FSM 2471.2.

It is necessary to locate planned regeneration areas three years in advance of cutting so that proper precut planning and coordination with other uses may be done. Some of the items to be considered are:

1. Scheduling the planned area to fit the rest-rotation grazing system for the allotment.

2. Building fence, if necessary.

3. Coordination with the State Game and Fish Department to schedule animal-remove numbers during hunting seasons so that heavy game-animal populations are reduced in the planned area.

4. Rodent control.

5. Site preparation and watershed protection.

6. Arrange for nursery seedlings or seed.

Once the treatment is accomplished, annual checks will determine the need for further treatment and protection.

2. Once the area is declared regenerated, the area should be placed on an Atlas as 1-20 year age class.

D. Calculation of Planned Cut

Area regulation with volume checks will be used to control the sawtimber cut. For sawtimber the cutting period is 20 years. The pulpwood cutting period is estimated to be 10 years. If necessary, adjustments of area or volumes cut can be made through the annual review and/or revision of this plan. A detailed explanation is in the appendix.

The pulpwood cut was determined using information derived from the 1959 pulpwood inventory and the 1961 Working Circle inventory.

E. Marking Rules

1. Refer to Regional marking guides, FSH 2442.8.

2. Marking will conform to the objectives of even-aged management, particularly through regeneration cuts which encourage creation of even-aged stands.

3. Overstory will be removed where:

   a. A dense understory is present and the overstory is sparce.

   b. The overstory is infected with disease or infested with insects or constitutes a hazard to the understory or to adjoining stands.

   c. Release of the understory is needed.

4. Priorities of cutting are:

   a. Disease-infected or insect-infested trees and stands.
   b. Virgin stands.
   *c. Oversized trees (over 28.5" d.b.h.).
   d. Stands over rotation age.

*During the next cutting period it is planned to harvest all trees over 28.5 inches d.b.h. This will enable operators to utilize smaller and faster logging equipment in future cutting periods.

The proposed 120-year rotation would provide mature trees approximately 24 inches d.b.h. Greater volume could be realized through reduced mortality and a reduction of defect percentage.

F. Records

Records will be kept by compartments in accordance with Forest and Region Three requirements.

G. Cutting Budget

1. Sawtimber Harvesting Schedule 1/

Table 12.

Fiscal Year Planned for Cutting	Block	Compartments	Sale Unit	Volume MMBF	Acres
1964	III		Harding Point	4.0	1,800
	V	To	Howard	8.0	2,640
	VII		Rim	40.0	18,181
	IV	Be	Pine Mountain	21.0	9,550
	II		Summit	1.0	450
	I and IV	Added	Inter	.7	300
	All		Small Sales	3.0	1,363
			Totals	77.7	34,284
1965	V		Howard	10.0	4,500
	III		Newman	2.0	900
	III		Wing Mountain	2.5	900
	VII		Rim	2.0	800
	VII		Blazed Ridge	30.0	13,600
	IV		Pine Mountain	22.0	10,000
	II		Summit	1.0	450
	I and IV		Inter	1.0	450
	All		Small Sales	3.0	1,360
			Totals	73.5	32,960
1966	III		Newman	11.0	5,450
	VII		Blazed Ridge	27.5	13,600
	IV		Pine Mountain	21.0	10,000
	II		Summit	1.0	450
	I and IV		Inter	0.5	250
	All		Small Sales	5.0	2,250
			Totals	66.0	32,000
1967	III		Newman	5.5	2,800
	V		Coulter	3.5	1,800
	II		Summit #2	1.0	450
	VII		Blazed Ridge	15.0	5,220
	VII		Bly	18.0	9,000
	IV		Pine Mountain	18.0	9,000
	All		Small Sales	5.0	2,250
			Totals	66.0	30,520

1/Schedule to be completed as compartment examination program progresses.

2. Pulpwood Harvesting Schedule

Table 13.

Fiscal Year Planned	Block	Compartment	Acres	Cords
1964	V	251.0	650	4,500
	III	237.0	650	4,500
	V	002.1	715	5,000
	IV	002.2	715	5,000
	VII	092.0	1,100	8,000
1965	V	236.0	650	4,500
	V	251.0	650	4,500
	V	003.1	1,300	10,000
	VII	093.0	1,100	8,000
1966	V	251.0	650	4,500
	V	236.0	650	4,500
	IV	003.2	715	5,000
	IV	007.1	715	5,000
	VII	094.0	1,100	8,000
1967	V	251.0	650	4,500
	V	236.0	650	4,500
	IV	320.0	715	5,000
	IV	005.3	715	5,000
	VII	095.0	1,100	8,000
1968	IV	219.0	1,290	9,000
	IV	011.2	715	5,000
	V	001.1	715	5,000
	VII	096.0	5,550	4,000
	VII	097.0	5,550	4,000

VII. TIMBER DISPOSAL POLICY

A. Sales and Point of Manufacture

The vast majority of the commercial forest land in the Working Circle (designated by the Chief as the Flagstaff Federal Sustained Yield Unit) is administered under Regulation S-4.

The policy statement for the Federal Unit requires that ". . . not less than 85 percent of the sawtimber sold . . . in the Unit must be given primary manufacture . . ." within three miles of the City of Flagstaff. The balance of the sawtimber is to be sold under Regulation S-6 under the competitive bid procedure -- without regard to the point of manufacture.

Other requirements and the entire policy statement are on file in both the Regional and Supervisor Offices.

Sales extending through periods of two to three years will be the normal pattern. The actual size of each sale will, of course, vary with the operation for which it is advertised and will be controlled by compartments and blocks.

B. Utilization

The Working Circle inventory (1961) indicates some 10.534 MMBM annual allowable cut of sawtimber-sized stems ranging from 11.6" to 18.5" d.b.h. with no log of better than Grade V quality. These stems have a questionable market value as sawtimber and may be harvested for pulp where no sawtimber outlet exists.

C. Logging Methods

Compartment examination will reveal the type of logging required in the rougher terrain.

D. Small Products

Besides providing pulpwood, other products can be derived from commercial thinning. An example is fence posts for ornamental, western-type fences for which a market is developing. The sale of this type product will be encouraged.

VIII. FOREST DEVELOPMENT

A. Transportation

A transportation plan and map for system roads is on file in each Ranger District office.

There are three areas of virgin timber where timber access roads have not, to date, been completed (Secret Mountain, Battleground Ridge, and the San Francisco Peaks area).

A tabular list of road needs is in the Appendix.

B. Reforestation

There are some 10,000 acres denuded by fire, borrow pits, and blowdowns presently in need of planting or direct seeding. There are also some 30,000 acres in need of fill-in planting, which will become apparent as the compartment examination and compartment prescription program progresses. The Pine Mountain Sale alone will provide 6,000 acres of regeneration cutting on Site 1 land. This area will be regenerated naturally, if possible, otherwise artificial regeneration will be needed. Another 6,000 acres of advanced age classes will be released on Site I.

Reforestation Program
Planned Planting Areas

Table 14.

Fiscal Year Planned for Project	Block Name	Block Number	Compartment	Acres
1964	Flagstaff	III	165	600
1965	Flagstaff	III	192	600
1966	Long Valley	IV	003.2	600
1967	Flagstaff	III	278	600
1968	Elden	II	132	600
1969	Winslow	VII	035.2	600
1970	Winslow	VII	034.2	600

C. Timber Stand Improvement

Timber stand improvement plans are maintained by each District Ranger. These plans provide for precommercial thinning, pruning, and dwarfmistletoe control. Thinning has top priority.

Pruning will be done on areas which have been put in "proper" condition, i.e., pruning will be carried out in thinned, vigorous stands and where it appears to be economically feasible considering future products to be obtained.

Noncommercial Thinning Schedule

Table 15.

Fiscal Year Planned for Project	Block Name	Block Number	Compartment	Acres
1964	Winslow	VII	002.2	640
	Elden	II	142.0	300
	Elden	II	131.0	640
1965	Flagstaff	III	277.0	1,300
	Mormon Lake	V	290.0	1,000
	Winslow	VII	073.0	1,500
1966	Flagstaff	III	276.0	1,000
	Mormon Lake	V	002.1	1,500
	Winslow	VII	074.0	1,500
1967	Mormon Lake	V	302.0	2,000
	Winslow	VII	012.0	1,000
1968	Long Valley	IV	001.1	500
	Winslow	VII	035.2	2,000
1969	Mormon Lake	V	002.1	1,000
1970	Winslow	VII	034.2	1,000
	Winslow	VII	052.0	1,500

D. Fire Control

1. Objectives

The primary objective of fire control is to hold fire losses to a level commensurate with the values protected. Specific fire presuppression and suppression objectives include the completion of roads to provide accessibility, construction of helispots, utilization of aerial tankers, intensive machine cleanup of slash, and construction of fire breaks in high hazard areas.

2. Fire Plan

A fire plan will be prepared in accordance with Regional standards for each advertised sale area. This plan will be reviewed with the timber operator by the responsible Forest Officer annually and revised as needed. This will ensure compliance with the sale contract and the fire plan provisions.

The following tabulation of fire occurrence and the resultant damage to the Forest for the past decade follows:

Table 16.

Year	Total Number Fires	Lightning	Man-Caused	Total Area
1952	259	207	52	190
1953	412	323	89	396
1954	496	427	69	4,310
1955	266	170	96	820
1956	502	420	82	1,105
1957	320	257	63	54
1958	448	374	74	45
1959	509	435	74	268
1960	667	607	60	167
1961	566	516	50	331
To 10/1962	510	443	67	46
Total	4,955	4,179	776	7,732
11-Yr.Avg.	450	380	71	703
50-Yr.Avg.	346	279	67	1,131

The vast network of roads permitting access to virgin areas has decreased travel time which results in smaller areas burned. Of this burned area, 380 acres have been reforested.

E. Rodent Control

Rodent control will be applied on plantations, on direct seeding projects, and on areas where evidence indicates the need.

F. Animal Control

Animal control will be applied to each area to be regenerated and continued until such a time when the young trees are past the danger of browse damage from animals. If the animals cannot be controlled by other methods, the area will be fenced.

G. Slash Treatment

Slash treatment will be coordinated with hazard reduction and thinning operations. Slash treatment plans will be made to meet the situations present on particular areas. In most cases recreation areas and roadside zones will receive complete slash cleanup. In other areas slash will be used to provide shade and protection for regeneration and to provide wildlife benefits.

H. Acquisition Needs

Timber and land administration would be simplified through acquisition or consolidation of the Aztec holdings. (Note timber harvesting schedule.) The acquisition of the Aztec holdings would increase the annual allowable cut by an estimated 1,500 M bd. ft. Also, more efficient land management could be brought about by acquiring smaller parcels of land which lie within the Forest boundary, particularly those in remote areas. Lands which today possess little or no resource value or use may gain status in the future because of population pressures and/or because of the development of new products or more demand for old ones.

End, Action Plan Section

IX. INSECT AND DISEASE CONTROL

A. General Conditions

The endemic nature of the Dendroctonus spp. and the Ips spp. present no special problem at the present time in the ponderosa pine on the Working Circle. However, the continuing insect outbreaks in the high value recreation areas in Oak Creek Canyon require constant surveillance and continuous action.

B. Special Problems

1. Insects

Infestations of epidemic proportions are present in the white fir along the Mogollon Rim and in the Douglas-fir areas on Mormon and Elden Mountains. Control is currently through sale and removal of the merchantable material and disposal of the slash.

2. Diseases

Dwarfmistletoe (Arceuthobium spp.) is the most damaging disease on the Working Circle. The most recent inventory indicates that 22% of the commercial forest area is infected. Dwarfmistletoe control will be given a high priority using the Forest guides developed for this purpose.

C. Handling Abnormal Conditions

Constant surveillance will be maintained and appropriate modification of cutting plans and debris treatment will be made. Direct control action will be taken as needed. Aerial fire patrols will be on the alert to detect and report signs of outbreaks. Epidemic outbreaks, once reported and handled, will be under continual inspection until control is assured. Regional assistance will be solicited when problems exist.

X. A P P E N D I X - Index

	Page
A. References	53
B. Statistical Analysis 1961 Inventory Data	55
C. Timber Data	56
Working Circle Inventory Data, Table 17.	56
Explanation of Inventory Data	57
Cu. Ft. Volumes Per Acre of Stems, Table 18.	58
Average Unmerchantability Factors, Table 19.	59
Ponderosa Pine Sawtimber Volumes, Table 20.	60
Douglas-fir and White Fir (Sawtimber Volumes)	61
Site Class Graph	62
Age Class Distribution Graph	63
Ponderosa Pine Age Class Distribution Graph	64
Automatic Data Processing Cards Used in 1961 Forest Inventory	65
D. Increment and Allowable Yield Calculations	66
1. Southwestern Ponderosa Pine Growth Formulae	66
2. A second method used to calculate growth and mortality	67
3. Calculation of Allowable Cut	68
Ponderosa Pine Per Acre Volumes, Table 23.	69
E. Records	70
Other Tables	
Allowable Annual Cut from Mill Blocks, Table 24.	71
Commercial Forest Types, Table 25.	74
Administrative Working Group, Table 26.	75

A P P E N D I X - Index (cont'd.)

	Page
Commercial Forest Acreage -- Sustained Yield Unit Table 27.	76
Acreage by Districts, Table 28.	77
Inaccessable Timber by Type	78
Tabular List of Road Needs	79
Commercial Available Forest Lands, Table 31	80/81

F. Maps

A. References

1. U.S. Department of Agriculture, Forest Service. Annual Reforestation and Stand Improvement Report, Fiscal Year Ended June 30, 1963. Albuquerque, New Mexico, Region 3, 1963.

2. Barrett, John W., ed., Regional Silviculture of the United States. New York, Ronald Press, 1962. 590 p.

3. Davis, Kenneth P., American Forest Management. New York, 1954. 451 p.

4. U.S. Department of Agriculture, Forest Service. The Flagstaff Federal Sustained Yield Unit: A Case Study. Flagstaff, Arizona, Forest Supervisor's Office, Coconino National Forest, 1947 - 1956.

5. _____ Timber Management Plan, Flagstaff Federal Sustained Yield Unit, Decade 1953 to 1962. Flagstaff, Arizona, Forest Supervisor's Office, Coconino National Forest, 1952.

6. _____ Flagstaff Working Circle Inventory (1961) Data. Flagstaff, Arizona, Forest Supervisor's Office, Coconino National Forest, 1962, 1963.

7. Forbes, Reginald D., ed., Forestry Handbook. New York, Ronald Press, 1961.

8. U.S. Department of Agriculture, Forest Service. "Multiple Use," Forest Service Manual, Title 2100. Washington, D.C., Forest Service Washington Office, 1957 - 1958, with amendments and supplements.

9. _____ "Timber Management." Forest Service Manual, Title 2400. Washington, D.C., Forest Service Washington Office, 1957 - 1958, with amendments and supplements.

10. Gross, L.S., Timber Management Plans on the National Forests. Washington, D.C., U.S. Government Printing Office, 1950.

11. Hawley, Ralph C., and Smith, David M., The Practice of Silviculture. New York, London, John Wiley and Sons, 1960.

12. Meyer, Walter H., Yield of Even-Aged Stands of Ponderosa Pine. Washington, D.C., U.S. Government Printing Office, 1961. 59 p. (U.S. Department of Agriculture, Technical Bulletin, No. 630.)

13. Meyer, Arthur H., and others, Forest Management. New York, Ronald Press, 1961. 275 p.

14. McArdle, Richard E., and others, the Yield of Douglas-Fir in the Pacific Northwest. Washington, D.C., U.S. Government Printing Office, 1961. 73 p. (U.S. Department of Agriculture, Technical Bulletin, No. 201.)

15. U.S. Department of Agriculture, Forest Service. Multiple Use Plans, Ranger Districts. Flagstaff, Arizona, Forest Supervisor's Office, Coconino National Forest.

16. Pearson, G.A., Management of Ponderosa Pine in the Southwest. Washington, D.C., U.S. Government Printing Office, 1950. 207 p. (U.S. Department of Agriculture, Monograph, No. 6.)

17. U.S. Department of Agriculture, Forest Service. Timber Management Plan, Payson Working Circle, Fourth Revision, 1962 through 1971. Phoenix, Arizona, Forest Supervisor's Office, Tonto National Forest, 1962.

18. _____ Pulpwood Survey. Flagstaff, Arizona, Forest Supervisor's Office, Coconino National Forest, 1959.

19. _____ Timber Management Plan, Sacramento Working Circle, Fourth Revision, 1962 through 1981. Alamogordo, New Mexico, Forest Supervisor's Office, Lincoln National Forest, 1962.

20. _____ Timber Management Handbook, Forest Service, Region Three. Albuquerque, New Mexico, Regional Office, 1948, with amendments.

21. _____ Timber Management Plan, Williams Working Circle, Fourth Revision, 1962 through 1966. Williams, Arizona, Forest Supervisor's Office, Kaibab National Forest, 1962.

B. Statistical Analysis 1961 Inventory Data

1. The following figures are based on the 110 - 10-point prism "locations."

2. Mean = 5,625

3. Number of locations = 110; EX = 618.800 M; EX^2 = 5492.7256

4. Standard Deviation = Sx = 4.246

5. Standard Error = $S_{\bar{x}}$ = 0.405

6. Percent Error = A = 7.2%

7. Coefficient of Variation = C = 75.484%

8. Number of locations needed for ± 10% accuracy; N = 57

C. Timber Data

Flagstaff Working Circle (Inventory Data 1961)

Working Circle Averages for Ponderosa Pine on the Operable Acreage in Tech. W.G. (PP and MC Types)

Table 17.

	Site I 16 Locations 14.6%	Site II 69 Locations 62.7%	Site III 25 Locations 22.7%	Weighted Averages & Totals
No. Stems/Acre, Yellow Pine (11.6"+)	3.52	3.61	4.44	3.79
No. Stems/Acre, Black Jack (5.0"+)	169.76	123.89	64.97	116.64
BJ Sawtimber (11.6"+)	19.95	13.31	8.60	13.16
BJ Poles (5.0"-11.5")	130.01	84.59	47.90	82.53
Volumes are Scribner				
Vol/Acre YP (Gross)	3,867	2,615	2,248	2,710
Vol/Acre BJ (Gross)	4,519	2,866	1,755	2,844
Total Vol/Acre (YP + BJ)	8,387	5,481	4,003	5,554
Mistletoe (% of Area)	24.4%	23.9%	15.5%	21.9%
Thinning (% of Area)	36.09%	33.77%	22.74%	31.5%
Site prep and/or planting %	28.0%	38.3%	37.5%	36.6%
Mortality/Acre b.f.	327	134	136	134 (or) 13.4 b.f./acre /year.
*BA/Acre-sq.ft. (5"+)	90	66	44	64

*Basal area figures include all trees 5.0"+ and all commercial species.

Working Circle Averages for White Fir and Douglas-fir

Species	Volume Per Acre (Gross)	
White Fir	59 b.f.	1/
Douglas-fir	12 b.f.	2/

1/ Based on 1 plot

2/ Based on 3 plots

Explanation of Inventory Data

1. The figures on the previous page were hand calculated from the IBM 1620 printouts of the 1961 Flagstaff Working Circle Inventory (1,100 prism points).

2. Dwarfmistletoe - If any dwarfmistletoe was present on a location (10 prism points), the location was considered to be infected with dwarfmistletoe.

3. Thinning - A location was considered to need thinning if more than half of the 10 prism points were overstocked or if a heavy dwarfmistletoe infestation was present along with a dense understory.

4. Site Preparation and Planting - A location was considered to need site preparation and/or planting if five or more prism points were nonstocked or were sparsely stocked.

Cubic Foot Volume Per Acre of Stems 5.0"-11.5" dbh.

Flagstaff Working Circle (Inventory Data 1961)

Ponderosa Pine

Table 18.

Age Class	Cubic Feet Per Acre			Weighted Average
	Site I	Site II	Site III	
1 - 20	178	184	213	193
21 - 40	640	519	131	509
41 - 60	886	512	261	476
61 - 80	236	131	180	153
81 - 100	0	50	0	42
101 - 120	259	24	0	135
121+	364	56	34	70
Average	495	268	139	272
Aspen				2
White Fir				3
Douglas-fir				4
Total Average				281

Volume table: C. A. Meyers, Table 2a, Volume to 4" top.

Flagstaff Working Circle

AVERAGE UNMERCHANTABILITY FACTORS

Table 19.

Species	U.F. Percent
Yellow pine	25
Blackjack	10
Douglas-fir	20
White fir	50

Ponderosa Pine Sawtimber Volumes
(1961 Inventory)

Based on Operable Forest Land, Technical Working Group,
(PP and MC Types)

Table 20.

District	Block	Site Class	Acres in Fed. Unit	Gross Volume 11.6" d.b.h.+ b.f. Scribner
		I	0	0
Beaver Creek	1	II	8,314	46,375.492
		III	0	0
Totals		All	8,314	46,375.492
		I	4,133	11,691.445
Elden	2	II	22,422	115,381.179
		III	36,550	113,465,191
Totals		All	63,105	240,537.815
		I	16,352	20,969.519
Flagstaff	3	II	102,743	475,051.692
		III	18,221	43,224.655
Totals		All	137,316	539,245,866
		I	33,454	399,510,973
Long Valley	4	II	96,014	580,350,584
		III	28,729	126,026,455
Totals		All	158,197	1,105,888,012
		I	17,129	65,678,387
Mormon Lake	5	II	107,843	545,903,767
		III	25,182	66,455,912
Totals		All	150,154	678,038,067
		I	8,362	68,882,757
Sedona	6	II	8,504	42,691,600
		III	17,392	82,795,056
Totals		All	34,258	194,368,412
		I	18,317	252,710,387
Winslow	7	II	69,555	509,808,338
		III	32,649	203,212,759
Totals		All	120,521	965,731,484
Federal Unit Totals		All	671,864	3,770,185,148
Outside Federal Unit		II	12,490	68,457,690
Technical Working Group Totals		All	684,354	3,838,642,838

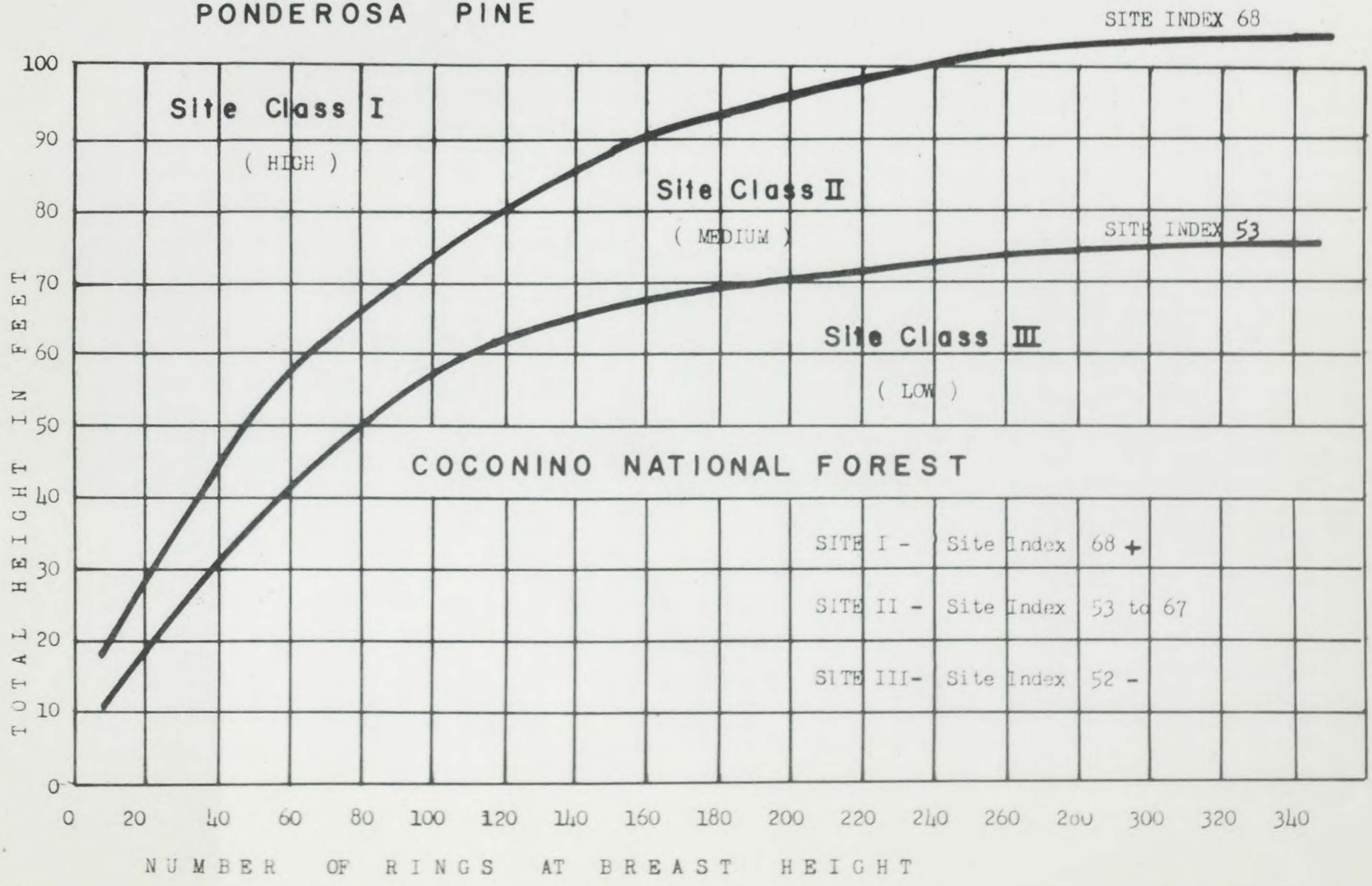
Douglas-fir and White Fir (Sawtimber Volumes)

(1961 Inventory)

Based on Operable Forest Land, Technical Working Group

Table 21 .

District	Block	Gross Volume (11.6" d.b.h.+) M.b.f. White Fir	Douglas-fir
Beaver Creek	1	0	0
Elden	2	2,773	564
Flagstaff	3	376	76
Long Valley	4	2,872	584
Mormon Lake	5	594	121
Sedona	6	0	0
Winslow	7	33,003	6,713
Totals		39,618	8,058



Adapted from Technical Bulletin 630, W.H. Meyer

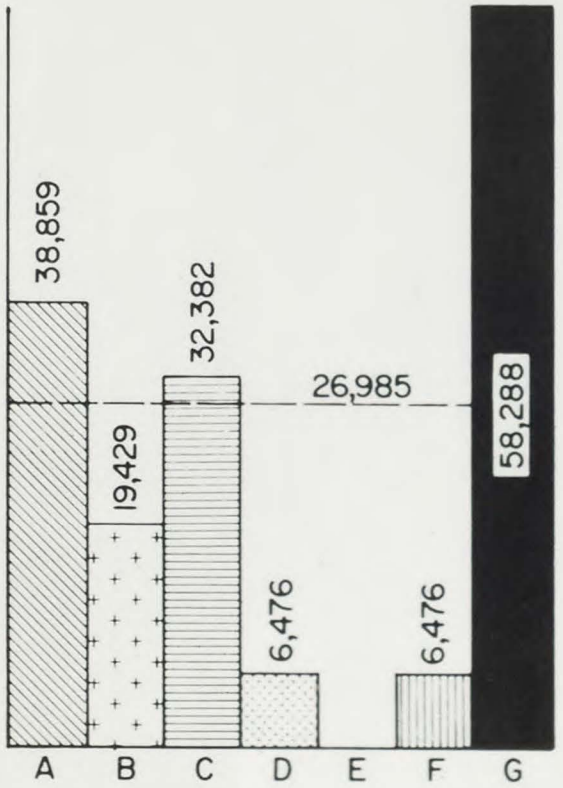
AGE CLASS DISTRIBUTION BY SITE

Age Class – Years

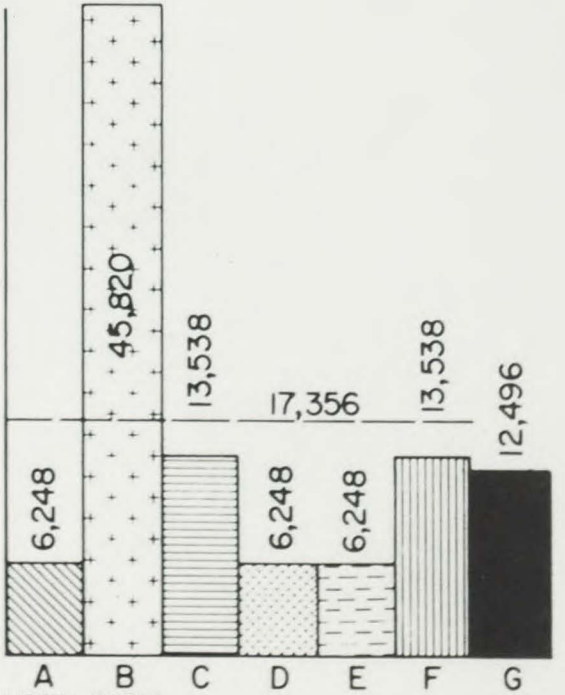
A	1–20	E	81–100
B	21–40	F	101–120
C	41–60	G	121 +
D	61–80		

— — — — Desired acres per age class

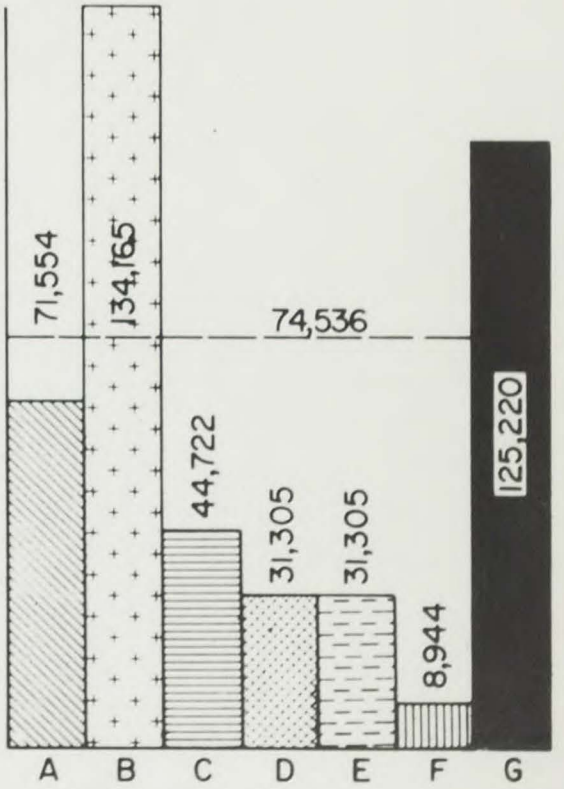
ALL FIGURES REPRESENT ACRES



LOW SITE
161,910



HIGH SITE
104,136

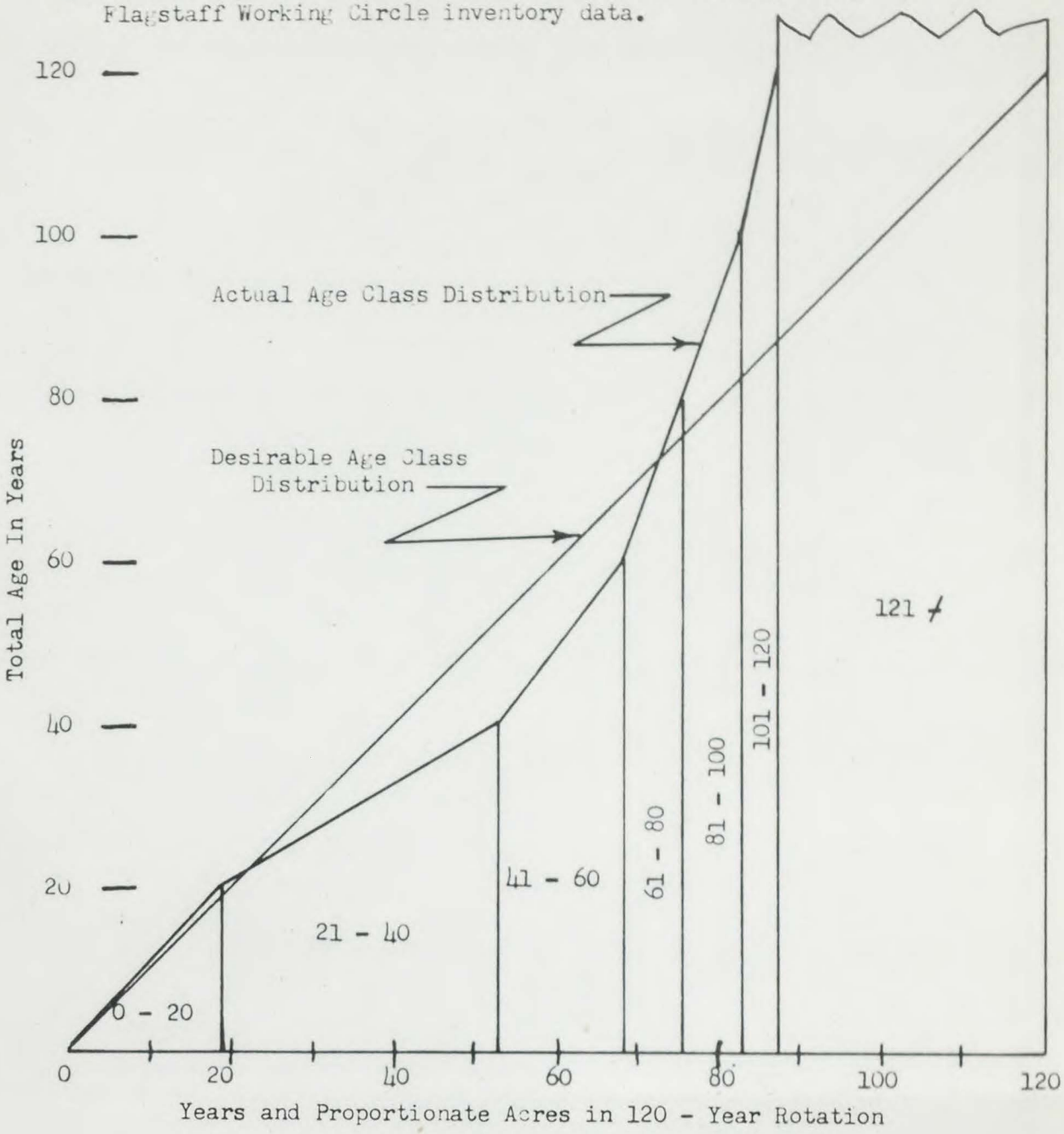


MEDIUM SITE
447,215

FLAGSTAFF WORKING CIRCLE
COCONINO NATIONAL FOREST

Ponderosa Pine Age Class Distribution

based on the operable acreage in the Technical Working Group Flagstaff Working Circle inventory data.



Automatic Data Processing Cards Used in 1961 Forest Inventory

INDIVIDUAL TREE CARD

Plot No.	Card No.	Point #	Cond.	Spp.	Dbh.	Total Height Feet	Saw Timber: Logs Height	Saw Timber: Cut	Saw Timber: Log Grades 1st 2nd 3rd 4th 5th 6th 7th 8th	Saw Timber: Lv.	Poles: Cut	Poles: Lv.	Site Tree Only: Age	Site Tree Only: Radial Growth 10 yrs.	Working Circle	Block Line or Comp	Prism Factor
0 0 0	0 0 0	0	L	YP	0 0.0	0 0 0	0.0	PR		GR	PU	PR	0 0 0	0.0 0	0 0	0 0	
2 4 6	8 10 12	14	16	18	20 22 24	26 28 30	32 34	36	38 40 42 44 46 48 50 52	54	56	58	60 62 64	66 68 70	72 74	76 78	80
1 1 1	1 1 1	1	D	BJ	1 1.1	1 1 1	1	PF	1 1 1 1 1 1 1 1	ST	TH	PP	1 1 1	1.1 1	1 1	1 1	
2 2 2	2 2 2	2	S	DF	2 2.2	2 2 2	2	MM	2 2 2 2 2 2 2 2	PU	MM	GS	2 2 2	2.2 2	2 2	2 2	20
3 3 3	3 3 3	3		ES	3 3.3	3 3 3	3	RR	3 3 3 3 3 3 3 3			PU	3 3 3	3.3 3	3 3	3 3	
4 4 4	4 4 4	4		LP	4 4.4	4 4 4	4	TO					4 4 4	4.4 4	4 4	4 4	40
5 5 5	5 5 5	5		WF	5 5.5	5 5 5	5.5	TH	5 5 5 5 5 5 5 5				5 5 5	5.5 5	5 5	5 5	
6 6 6	6 6 6	6		AS	6 6.6	6 6 6	6	MA					6 6 6	6.6 6	6 6	6 6	
7 7 7	7 7 7	7		AP	7 7.7	7 7 7	7	SS					7 7 7	7.7 7	7 7	7 7	
8 8 8	8 8 8	8			8 8.8	8 8 8	8	PU					8 8 8	8.8 8	8 8	8 8	
9 9 9	9 9 9	9			9 9.9	9 9 9	9						9 9 9	9.9 9	9 9	9 9	
2 4 6	8 10 12	14	16	18	20 22 24	26 28 30	32 34	36	38 40 42 44 46 48 50 52	54	56	58	60 62 64	66 68 70	72 74	76 78	80

IBM J60S89

PLOT CARD (Last card to be completed on Plot) Crew Initials _____ Date _____

Plot Number	Card Number	Use for Growth?	Reproduction: Stock	Reproduction: Treat	Reproduction: Plant	Reproduction: Seed	Reproduction: Site P.	Reproduction: Comp	Reproduction: Number 0-3.9"	Rock: Surf.	Rock: Solid	% Slope	Aspect	Acces.	Map Overstory Type	New Photo Number	Plot Age or Sale No.	Forest	WC	Block Line or Comp	Rep Spp.
0 0 0	0 0 0	Y	Y	TH	H	Y	H	O	0 0 0	Y	Y	0 0	N	Y	P C	0 0 0 0 0	0 0	0 0	0 0	0 0	
2 4 6	8 10 12	14	16	18	20	22	24	26	28 30 32	34	36	38 40	42	44	46 48 50 52	54 56 58 60 62	64 66	68 70	72 74	76 78	80
1 1 1	1 1 1	N	N	MM	M	N	M	G	1 1 1	N	N	1 1	S	N	M 1 — V	1 1 1 1 1	1 1	1 1	1 1	1 1	PP
2 2 2	2 2 2							B	2 2 2			2 2	E		S 2 = R	2 2 2 2 2	2 2	2 2	2 2	2 2	DF
3 3 3	3 3 3							R	3 3 3			3 3	W		A 3 ≡ X	3 3 3 3 3	3 3	3 3	3 3	3 3	ES
4 4 4	4 4 4							L	4 4 4			4 4			PJ N	4 4 4 4 4	4 4	4 4	4 4	4 4	LP
5 5 5	5 5 5							W	5 5 5			5 5			O	5 5 5 5 5	5 5	5 5	5 5	5 5	WF
6 6 6	6 6 6							A	6 6 6			6 6				6 6 6 6 6	6 6	6 6	6 6	6 6	AS
7 7 7	7 7 7							J	7 7 7			7 7				7 7 7 7 7	7 7	7 7	7 7	7 7	AP
8 8 8	8 8 8							D	8 8 8			8 8				8 8 8 8 8	8 8	8 8	8 8	8 8	
9 9 9	9 9 9								9 9 9			9 9				9 9 9 9 9	9 9	9 9	9 9	9 9	
2 4 6	8 10 12	14	16	18	20	22	24	26	28 30 32	34	36	38 40	42	44	46 48 50 52	54 56 58 60 62	64 66	68 70	72 74	76 78	80

IBM J60S89

D. Increment and Allowable Yield Calculations

(Ponderosa Pine and Mixed Conifer Types)

1. Southwestern Ponderosa Pine Growth Formulae

a. Data Used in Formulae

(1) Number of reserve trees

(7.6" to 11.5" d.b.h.) . . . . . 27.10 trees/acre

(2) Number of reserve trees 11.6" d.b.h. and larger . . . . . 3.79 trees/acre

(3) Basal area of reserve trees 11.6" d.b.h. and larger . . . . . 33.0 sq. ft./acre

(4) Bd. ft. volume (gross) of reserve trees 11.6" d.b.h. and larger. . . . . .5,554 b.f./acre

b. Mortality

Mortality = [3.4142 + 0.0151 (Reserve Vol.) - 1.2156 (Reserve B.A.)] + 3

Mortality = 15.7 b.f./acre 1 year

c. Gross Increment of Original Trees

(trees over 11.5" d.b.h. at time of inventory)

Log Gross Growth = 1.9385-0.5815(Log Reserve Vol.) + 1.4366(log reserveB.A)

Gross Growth = 87.60 b.f./acre/yr.

d. Ingrowth (Vol. reaching 11.6" d.b.h. during growth period)

Log Ingrowth = 0.8601 - 0.2342 (Log Reserve No. Trees 11.6"+)

Log Ingrowth = 1.7074

Ingrowth = 50.98 b.f./acre/yr.

e. Computed Net Annual Increment

Increment = Gross Growth of original trees + Ingrowth - Mortality

Gross Increment = 122.88 b.f./acre/yr.

e. Computed Net Annual Increment (Cont.)

Net Annual Increment = 122.88 b.f. - 20% (122.88 b.f.) (20%=defect,etc.)

Net Annual Increment = 98.0 b.f./acre/yr.

2. A second method used to calculate growth and mortality follows:(7)

GROWTH AND MORTALITY

Table 22 .

	Working Circle Total - 10 Yrs	Per Acre Data Averaged over 647,468 acres 5/	
		10-Yr Total	Annual Average
	Mbf.	Bd.Ft.	Bd.Ft.
Sawtimber Yield (Actually cut from 284,661 acres) 1/ Averaged over 647,468 acres 5/	533,618	824	82
Net Volume Increase 2/ (1962 Inventory minus 1952 Inventory)	159,487	246	25
Net Growth 3/	693,105	1,070	107
Unsalvaged Mortality	86,761	134	13
Gross Growth 4/	779,866	1,204	120

1/ An average cut of 1,875 bd. ft. per acre actually cut.
2/ Net Volume Increase = Difference in standing live volume between the two inventories, 1952 and 1962.
3/ Net Growth = Net Increase + Yield.
4/ Gross Growth = Net Growth + Unsalvaged Mortality.
5/ In the 1952 Management Plan the Net Available and Operable Area was 647,468 acres. All differences in inventory data in both inventories have been related to these acres only. Board foot growth has been computed for these acres only. This Plan shows 719,499 acres as available and operable in the F.S.Y.U. and the Working Circle. The 72,031 acres are those acres which were supporting only small material, or were poorly stocked or nonstocked areas, or were the timbered areas which are within the Flagstaff Working Circle but outside the limits of the Flagstaff Federal Sustained Yield Unit, or were the timbered areas in the Flagstaff Municipal Watershed Working Group. These acreages include the 6,238 acres of operable timber from the Williams Working Circle, Kiabab National Forest, which is a part of the Flagstaff F.S.Y.U.

3. Calculation of Allowable Cut

a. Net Growth Per Year = 107 b.f./acre/yr. x 684,354 acres

Net Growth Per Year = 73,226 M.b.f.

b. Anticipated Mortality Per Year = 13.4 b.f./acre x 684,354 acres

Anticipated Mortality Per Year = 9,000 Mbf = Unregulated Cutting Objective.

c. Annual Allowable Cut = Adjusted Net Growth

Adjusted Net Growth = (Net Growth) - f(Net Growth)

f = Adjustment Factor = 10%

Adjusted Net Growth = (73,226 Mbf) - .10 (73,226 Mbf)

Adjusted Net Growth = 66,000 Mbf.

Annual Allowable Cut = 66,000 Mbf.

d. Sawtimber Size-Class and Condition

Size Class or Condition	Volume (Mbf.)
Sawtimber - Sized Pulpwood (11.6" to 18.5" d.b.h.) Containing no Log Better Than Grade V	10,534
Other Sawtimber	55,379
Anticipated Mortality (Unregulated Cutting Objective)	9,087
Total	75,000

PONDEROSA PINE PER ACRE VOLUMES (from 1961 1100 Pt. Inventory)

Table 23.

Condition	Volumes (Scribner) Gross Volume Per Acre	Net Volume Per Acre
Poor Risk	188	133
Poor Form	652	492
Mistletoed	407	332
Toppers	623	561
Thinners	55	52
Mature 28" and Under	1,020	867
Mature over 28"	812	568
Pulp	564	533
Sanitation Salvage	4	0
Total	4,325	3,538
Leave	1,272	1,246
Total Vol. Per Acre	5,597	4,784

E. Records

1. Past Cutting Record

2. Record of Cut

a. Sawtimber

b. Pulpwood, etc.

ALLOWABLE ANNUAL CUT

From Large Mill Blocks - Virgin	44.1 MM
From Small Mill Blocks - Virgin	6.7 MM
From Small Mill Blocks - Cutover	6.0 MM

Table 24.

(Volumes are MBM)

	LARGE MILL BLOCKS				SMALL MILL BLOCKS - VIRGIN				SMALL MILL BLOCKS - CUTOVER				TOTAL		
Year	Budget	Total Cut	Under- or Overcut	Acres Cut Over	Budget	Total Cut	Under- or Overcut	Acres Cut Over	Budget	Total Cut	Under- or Overcut	Acres Cut Over	Vol. Cut All Blocks	Salvage	Pulpwood Cords
1953	44100	44930	830	14913	6700	8812	2112	6878	6000	2442	3558	2577	56184	1140	
1954	43270	38621	4649	11851	4588	4186	402	4700	9558	9041	517	15950	51848	2373	
1955	48749	48627	122	14227	7102	4605	2497	4001	6517	5883	634	19435	59115	686* 1796	
1956	44222	44448	226	13420	9197	5806	3391	6110	6634	6026	608	5635	56280	1610	
1957	43874	29487	14387	10373	10091	1424	8667	2050	6608	4894	1714	7121	35805	1344	
1958	58487	48135**	10352	11594	15367	2660	12707	2546	7714	10138	2424	11699	60933**	712	
1959	54452	44722***	9730	15827	19407	1857	17550	1540	3576	8656	5080	15693	55235***	704	
1960	53830	30997+	22833	15922	24250	2746	21504	2338	920	4014	3094	6840	37757+	519	2700
1961	66933	39301++	27632	10707	28204	3484	24720	3100	2906	7552	4646	8574	50337++	281	
1962	71732	53326#	18406	33301	31420	13048##	18372	3288	1354	3750###	2396	2451	70124	237	7350####

*Williams Working Circle
**Includes 14849 estimated cut and not reported (Cold Deck)
***Includes 15580 estimated cut and not reported (Cold Deck)
+Includes 11000 estimated cut and not reported (Cold Deck)
++Includes 13664 estimated cut and not reported (Cold Deck)
#Includes 19131 estimated cut and not reported (Cold Deck)
##Includes 802 estimated cut and not reported (Cold Deck)
###Includes 1904 estimated cut and not reported (Cold Deck)
####Includes 1700 cords pulpwood cut and not reported (Woodyard)

RECORD OF SMALL PRODUCTS CUT

Fiscal Year	Block	Pulpwood			Poles		Christmas Trees	Aspen
		Acres	Cords	Mbf	Lineal Feet	Mbf	Number	Cords

Fiscal Year_____
Volumes are Mbf.

Allowable Annual Cut
Greenwood . . . 66MM
Salvage 9MM

RECORD OF SAWTIMBER AND AREAS CUT

Brought Forward

Block	Reproduction and Intermediate Cuts (Green wood)			Salvage (including anticipated mortality)	Total Cut		Acres	Volume
	Acres Cutover	Total Cut	Undercut or Overcut		Acres	Volume	Accumulative Acres	Accumulative Volume

COMMERCIAL FOREST TYPES - - - Working Circle

Table 35.

Block		Number of Acres by Timber Type					*	
		Pine	Mixed Conifer	Aspen	Cypress	Inaccess. Timber Type	Taken Out of Produc.	Total
Beaver Creek	I	10,534	--	--	--	80	980	11,594
Elden	II	73,911	420	1,690	--	17,295	3,526	96,842
Flagstaff	III	144,315	57	5,895	--	23,373	7,820	180,460
Long Valley	IV	169,825	435	5	--	4,335	6,908	181,508
Mormon Lake	V	153,956	90	55	--	1,400	5,920	161,421
Sedona	VI	34,703	--	--	11,903	5,573	1,092	53,271
Winslow	VII	127,805	5,000	--	--	9,648	5,586	148,039
Total	**	715,049	6,002	6,645	11,903	61,704	31,832	833,135

*Includes roads, power line rights-of-way, fire, etc.

**These acres show an appreciable increase over the previous plan which showed commercial sawtimbered acres only.

ADMINISTRATIVE WORKING GROUP

Table 26.

Block		Pine Cutover Acres			
		Roadside Zones	Recreation Areas	Administrative Sites	Total
Name	No.				
Beaver Creek	I	560	50	320	930
Elden	II	2,075	705	260	3,040
Flagstaff	III	2,120	715	591	3,426
Long Valley	IV	2,495	540	560	3,595
Mormon Lake	V	2,750	260	280	3,290
Sedona	VI	1,400	5,542	380	7,322
Winslow	VII	1,000	40	836	1,876
Total Acres		12,400	7,852	3,227	23,479

COMMERCIAL FOREST ACREAGE - - - Sustained Yield Unit

Table 27.

Blocks		Pine Cutover	Pine Virgin	Mixed Conifer	Aspen	Inaccessible Timber Type	Taken out of Production**	Total Acres
Name	No.							
Beaver Creek	I	7,634				80	980	8,694
Elden	II	69,827	3,944	420	1,690	17,295	3,526	96,702
Flagstaff	III	139,845	8,712	57	4,895	23,373	7,820	184,702*
Long Valley	IV	148,494	20,761	435	5	4,335	6,908	180,938
Mormon Lake	V	148,910	130	90	55	1,400	5,920	156,505
Sedona	VI	27,693	6,550			5,573	1,092	40,908
Winslow	VII	90,848	35,449	5,000		9,648	5,586	146,531
Totals		633,251	75,546	6,002	6,645	61,704	31,832	814,980

* Includes 6,238 acres within the Kaibab National Forest and is controlled and reported by the Flagstaff Ranger District

** Includes roads, power line R/W's, fire, etc.

FLAGSTAFF WORKING CIRCLE

ACREAGE BY DISTRICTS

Table 28.

Block	District	Gross Acres Within Nat'l. Forest Boundary	Alienated Land	Net Acres
1.	Beaver Creek	318,243	15,085	303,158
2.	Elden	303,076	32,415	270,661
3.	Flagstaff	303,211	58,570	244,641
4.	Long Valley	242,274	13,025	229,249
5.	Mormon Lake	294,374	15,465	278,909
6.	Sedona	270,021	27,458	242,563
7.	Winslow	268,305	36,395	231,910
Total		1,999,504	198,413	1,801,091

FLAGSTAFF WORKING CIRCLE

INACCESSABLE TIMBER BY TYPE

Table 29.

District	Virgin			
	Pine Acres	Mixed Conifer Acres	Aspen Acres	Total
Beaver Creek	80			80
Elden	6,545	10,470	280	17,295
Flagstaff	21,679	1,249	445	23,373
Long Valley	4,335			4,335
Mormon Lake	1,400			1,400
Sedona	5,573			5,573
Winslow	4,648	5,000		9,648
Total Acres	44,260	16,719	725	61,704

Tabular List of Road Needs

Table 30.

Fiscal Year Sale Planned	Block	Sale Name or Designation	Road Number	Design Class	Character of work	Forest Service Miles	Forest Service Cost (1000$)	Operator Miles	Operator Cost (1000$)	Fiscal Year to Complete
1964	VII	Blazed Ridge	4-123	12 SN	Const.	5.8	120	5.8	200	1966
1964	V	Howard	4-132	-- --	Rehab.	---	---	3.2	8	1964
1965	VII	Bly	482.9	-- --	Surface	5.0	1	- -	25	1966
1966	V	Coulter	4-132	-- --	Rehab.	12.0	4	12.0	60	1967
1968	IV	Tom's Creek	4-142	-- --	Surface	8.0	2	- -	40	1968
1968	VI	Wood's Ranch	4-127	-- --	Const.	7.0	60	- -	--	1969
1968	VI	+ Rock Top	4-127.2	-- --	Surface	---	---	4.0	30	1969

FLAGSTAFF WORKING CIRCLE & FEDERAL UNIT COMBINED

COMMERCIAL AVAILABLE FOREST LANDS

Table 21. Page 1

OPERABLE LANDS

BLOCK	DISTRICT OR LOCATION	PINE CUTOVER			PINE VIRGIN	ALL PINE	MIXED CONIFER			ASPEN			ARIZONA CYPRESS	TOTAL OPERABLE ACRES
		OUTSIDE FSYU	INSIDE FSYU	SUB-TOTAL			CUTOVER	VIRGIN	ALL MC	CUTOVER	VIRGIN	ALL ASPEN		
1	Beaver Creek	2,900	7,634	10,534	--	10,534	--	--	--	--	--	--	--	10,534
2	Elden	140	69,827	69,967	3,624	73,591	403	17	420	--	1,690	1,690	--	75,701
3	Flagstaff	1,996	133,607	135,603	3,069	138,672	57	--	57	200	4,695	4,895	--	143,624
Kaibab N.F.		--	6,238	6,238	--	6,238	--	--	--	--	--	--	--	6,238
4	Long Valley	570	148,494	149,064	18,934	167,998	--	435	435	--	5	5	--	168,438
5	Mormon Lake	4,916	148,910	153,826	130	153,956	90	--	90	--	55	55	--	154,101
6	Sedona	460	29,673	28,153	6,550	34,703	--	--	--	--	--	--	11,903	46,606
7	Winslow	1,508	90,848	92,356	35,449	127,805	2,350	2,650	5,000	--	--	--	--	132,805
TOTALS		12,490	633,251	645,741	67,756	713,497	2,900	3,102	6,002	200	6,445	6,645	11,903	738,047

FLAGSTAFF WORKING CIRCLE & FEDERAL UNIT COMBINED

INOPERABLE					RESERVED LANDS (NONCOMMERCIAL)							TOTALS
INOPERABLE LAND					PINE VIRGIN		EXPERIMENTAL FOREST					
PINE VIRGIN	MC VIRGIN	ASPEN VIRGIN	ALL INOP-ERABLE	TOTAL COMMERCIAL	NAT'L AREA	WILDER-NESS AREA	PINE VIRGIN	PINE CUTOVER	ALL EXP. FOREST	TAKEN OUT OF PRODUCTION	TOTAL RESERVED	TOTAL FORESTED LANDS
80	--	--	80	10,614	--	--	--	--	--	980	980	11,594
6,545	10,470	280	17,295	92,996	--	--	--	320	320	3,526	3,846	96,842
21,679	1,249	445	23,373	166,997	160	1,650	600	3,233	3,833	7,820	13,463	180,460
--	--	--	--	6,238	--	--	--	--	--	--	--	6,238
4,335	--	--	4,335	172,773	--	--	--	1,827	1,827	6,908	8,735	181,508
1,400	--	--	1,400	155,501	--	--	--	--	--	5,920	5,920	161,421
5,573	--	--	5,573	52,179	--	--	--	--	--	1,092	1,092	53,271
4,648	5,000	--	9,648	142,453	--	--	--	--	--	5,586	5,586	148,039
44,260	16,719	725	61,704	799,751	160	1,650	600	5,380	5,980	31,832	39,622	839,373

F. MAPS

(All maps are bound separately.)

1. Forest-wide ½" Compartment Map
2. Forest-wide ½" Sawtimber Harvest Program and Transportation Map
3. Forest-wide ½" Small Products Harvesting Program Map
4. Forest-wide ½" Reforestation Program Map
5. Forest-wide ½" Timber Stand Improvement Program Map
6. Beaver Creek District 1" Working Group Map
7. Elden District 1" Working Group Map
8. Flagstaff District 1" Working Group Map
9. Long Valley District 1" Working Group Map
10. Mormon Lake District 1" Working Group Map
11. Sedona District 1" Working Group Map
12. Winslow District 1" Working Group Map